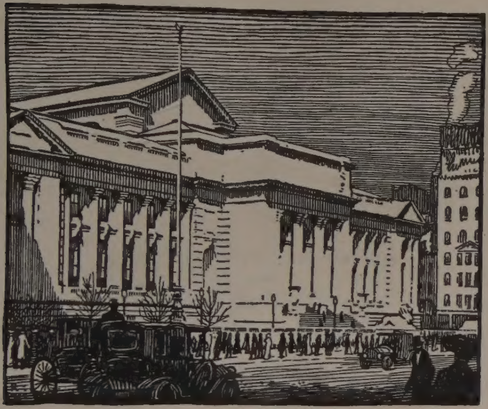
BULLETIN

OF THE

NEW YORK PUBLIC LIBRARY

ASTOR, LENOX AND TILDEN FOUNDATIONS



DECEMBER 1926

VOLUME 30 - - - NUMBER 12

EARLY LIBRARY DEVELOPMENT IN NEW YORK STATE (1800–1900). BY GEORGE WATSON COLE. PART II. *(Conclusion)* - - - 917
JOHN GREENWOOD, ARTIST, AND THE ISAAC JOHN GREENWOOD COLLECTION - - - - - - - - - - - - - - 926
SIR FRANCIS SEYMOUR HADEN AS A COLLECTOR - - - - - 928
NEWS OF THE MONTH - - - - - - - - - - 930
NEW PERIODICALS - - - - - - - - - - - 932
INSULATING OIL (1900–1925). A LIST OF REFERENCES IN THE NEW YORK PUBLIC LIBRARY. PART II. *(Conclusion)* - - - 935
INTERESTING RECENT ADDITIONS - - - - - - - - 989
CIRCULATION STATISTICS FOR THE MONTH OF NOVEMBER - - - 992
PRINCIPAL DONORS IN NOVEMBER - - - - - - - - 993
PUBLICATIONS OF THE NEW YORK PUBLIC LIBRARY - - - - 994

NEW YORK
1926

PRINTED AT THE NEW YORK PUBLIC LIBRARY

form p5 [xii-20-26 1650]

THE Bulletin is published monthly by The New York Public Library at 476 Fifth Avenue, New York City. Subscription $1.00 a year, current single numbers 10 cents. Entered at the Post Office at New York, N. Y., as second-class matter, February 10, 1897, under Act of July 16, 1894. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized. Printed at The New York Public Library, 476 Fifth Avenue. December, 1926. Volume 30, Number 12.

BULLETIN
OF THE
NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

VOLUME 30
JANUARY TO DECEMBER
1926

NEW YORK
1926

CONTENTS OF VOLUME 30

PAGE

Additions (Interesting Recent). See The New York Public Library — Additions (Interesting Recent).

Albany Library, Petitioners for Founding the, in 1792 649

Avery, S. P., Collection of Prints 864

Black, George F. Macpherson's Ossian 413

Black, George F. Macpherson's Ossian and the Ossianic Controversy. A Contribution Towards a Bibliography 424, 508

Bloch, Joshua. Jewish Life in Oriental Countries 868

Bonn, Arthur. The S. P. Avery Collection of Prints 864

Cassatt, Mary—Print-Maker 858

Chew Collection of Milton Portraits 3

Cole, George Watson. Early Library Development in New York State (1800–1900) 849, 917

Criticism and Literary Theory, The J. E. Spingarn Collection of . 225

Do Men Read? 565

Donors (Principal). See The New York Public Library — Donors (Principal).

Doty, Marion Foster. Selenium: 1817–1925. A List of References 440, 525, 599, 728, 793

Early Library Development in New York State (1800–1900) . 849, 917

Economic and Sociological Periodicals in The New York Public Library 28, 449, 717, 881

Fyfe, Arthur W., Jr. Insulating Oil (1900–1925). A List of References 892, 935

Gavarni at Work 416

George, Henry, and the Single Tax. A List of References to Material 481, 571, 685

The Gompers Collection 155

Granniss, Ruth S. The Beverly Chew Collection of Milton Portraits 3

Greenwood, John, Artist, and the Isaac John Greenwood Collection 926

PAGE

Haden, Sir Francis Seymour, as a Collector 928

Hayden, J. L. R. Introduction to Insulating Oil. A List of References 892

Illustrations:

The Beverly Chew Collection of Milton Portraits:

John Milton (The "Faithorne Type"). Engraved by Robert White . . . . *facing* 3

Gavarni at Work:

Trial Proof of Lithograph by Gavarni, with Notes by the Artist . . . . *facing* 413

Henry George and the Single Tax:

Bronze Bust of Henry George, by his Son, Richard F. *facing* 481

First Page of "Progress and Poverty" as the Author Penned It . . . . *facing* 482

Mary Cassatt—Print-Maker:

"The Stocking." Drypoint by Mary Cassatt . . *facing* 859

The Old Sporting Print and the New:

Fox Hounds Breaking Cover. Aquatint in Color by Henry Alken . . . . *facing* 749

Migrating Geese. Drypoint by Frank W. Benson . *facing* 750

Shepherd's Pool—Orchy. Drypoint by Norman Wilkinson *facing* 752

Petitioners for Founding the Albany Library in 1792:

Petition for Albany Library, 1792 . . . *2 plates facing* 649

Report for 1925:

The Public Library Steps. By Tony Sarg . . *facing* 275

Collating and Mending Books. Extra or Fine Binding *facing* 310

Covering and Binding Books. Covering Newspapers with Japanese Tissue . . . . *facing* 311

Great Kills Sub-branch, Staten Island . . . *facing* 340

Insulating Oil (1900–1925). A List of References . . . 892, 935

Irvingiana, Catalogue of the Seligman Collection of 83

Jewish Life in Oriental Countries 868

Kennedy, E. G., Gift 156

Library Development, Early, in New York State (1800–1900) 849, 917

PAGE

MACPHERSON'S OSSIAN 413

MACPHERSON'S OSSIAN AND THE OSSIANIC CONTROVERSY. A CONTRIBUTION TOWARDS A BIBLIOGRAPHY 424, 508

MEYER, AMY. MUSIC DIVISION 754

MILTON PORTRAITS, THE BEVERLY CHEW COLLECTION OF 3

THE NEGRO HARLEM EXHIBITION 157

THE NEW YORK PUBLIC LIBRARY:
  ADDITIONS (INTERESTING RECENT) 50, 135, 201, 258, 469, 630, 738, 825, 989
  DONORS (PRINCIPAL) 63, 147, 215, 267, 405, 473, 557, 641, 741, 841, 909, 993
  MUSIC DIVISION 754
  NEWS OF THE MONTH 7, 80, 159, 229, 402, 417, 504, 568, 651, 755, 860, 930
  PERIODICALS (NEW) 10, 82, 161, 231, 419, 506, 569, 652, 757, 862, 932
  PUBLICATIONS 64, 148, 216, 268, 406, 474, 558, 642, 742, 842, 910, 994
  REPORT FOR 1925 275
  STATISTICS (CIRCULATION) . . . 62, 146, 214, 266, 404, 472, 556, 640, 740, 840, 908, 992

NEW YORK STATE, EARLY LIBRARY DEVELOPMENT IN (1800–1900) 849, 917

NEW YORK TERCENTENARY. AN EXHIBITION OF THE HISTORY OF NEW NETHERLAND 655, 759

NEWS OF THE MONTH. SEE THE NEW YORK PUBLIC LIBRARY — NEWS OF THE MONTH.

OIL, INSULATING (1900–1925). A LIST OF REFERENCES 892, 935

OPERA PLOTS, INDEX TO 12, 110, 164, 233

ORIENTAL COUNTRIES, JEWISH LIFE IN 868

OSSIAN, MACPHERSON'S 413

OSSIAN, MACPHERSON'S, AND THE OSSIANIC CONTROVERSY. A CONTRIBUTION TOWARDS A BIBLIOGRAPHY 424, 508

PALTSITS, VICTOR HUGO:
  THE NEW YORK TERCENTENARY. AN EXHIBITION OF THE HISTORY OF NEW NETHERLAND 655, 759
  PETITIONERS FOR FOUNDING THE ALBANY LIBRARY IN 1792 649

PERIODICALS, ECONOMIC AND SOCIOLOGICAL, IN THE NEW YORK PUBLIC LIBRARY 28, 449, 717, 881

PAGE

Periodicals (New). See The New York Public Library—Periodicals (New).

Petitioners for Founding the Albany Library in 1792 649

Print, Sporting, The Old and the New: From Alken to the Present 749

Print Room, A Year's Growth in 223

Prints, The S. P. Avery Collection of 864

Publications. See The New York Public Library — Publications.

Report of the Library. See The New York Public Library—Report for 1925.

Rieck, Waldemar. Index to Opera Plots 12, 110, 164, 233

Sawyer, Rollin Alger. Henry George and the Single Tax. A List of References to Material 481, 571, 685

Schnacke, M. K. The Samuel Gompers Collection 155

Selenium: 1817–1925. A List of References . 440, 525, 599, 728, 793

Seligman Collection of Irvingiana, Catalogue of 83

Single Tax, Henry George and the. A List of References to Material 481, 571, 685

Slavonic Division — Recent Growth 71

Sociological and Economic Periodicals in The New York Public Library 28, 449, 717, 881

Spingarn Collection of Criticism and Literary Theory 225

Sporting Print, The Old and the New: From Alken to the Present 749

Statistics (Circulation). See The New York Public Library—Statistics (Circulation).

Weitenkampf, Frank:
  The Art of the Wood Engraver 226
  Gavarni at Work 416
  John Greenwood, Artist, and the Isaac John Greenwood Collection 926
  Mary Cassatt — Print-Maker 858
  The Old Sporting Print and the New: From Alken to the Present 749
  Sir Francis Seymour Haden as a Collector 928
  A Year's Growth in the Print Room 223

Wood Engraver, The Art of the 226

Yarmolinsky, Abraham. The Slavonic Division — Recent Growth 71

BULLETIN

OF THE

NEW YORK PUBLIC LIBRARY

ASTOR, LENOX AND TILDEN FOUNDATIONS

LUME 30 DECEMBER, 1926 NUMBER 12

EARLY LIBRARY DEVELOPMENT IN NEW YORK STATE (1800–1900)

BY GEORGE WATSON COLE, L.H.D. (Litt.D.)
Librarian Emeritus of the Henry E. Huntington Library and Art Gallery

PART II

(Conclusion)

We now see the School District Libraries of New York firmly established nd entering upon a career of rapid growth which was to become the marvel f the times. As has been said, the law of 1835, establishing these libraries, oreshadowed nearly every important phase of library development in which ve of to-day take much pride. Let us now briefly enumerate the principal eatures of the law and the opinions of those interested in the administration of these libraries, and see if this assertion is correct.

In the first place, the principle of taxation for the formation and maintenance of free lending libraries was well established as early as 1835. It as been asserted that the Massachusetts Act of 1848, authorizing Boston to evy a tax for the establishment of a free public library, was "really the germ out of which has grown much of the library legislation in this as well as in other countries." At the time that law was passed, New York had over 11,000 districts, in nearly all of which were free lending libraries containing an aggregate of 1,310,986 volumes, which were being maintained by voluntary taxation, and, more progressive still, aided by an annual appropriation from the state; and all this under a law passed for the purpose thirteen years before the Massachusetts law was enacted.

In the second place, we see the principle of state aid to public libraries firmly established, by the law of 1838, and an annual appropriation of $55,000 made for the purpose, which amount has been continued from that day to the present, and which down to 1900 had never at any time fallen below $50,000. And this principle we have lived to see extended to the support of the free circulating library, whether connected or not with the educational system of the state. The broad principle that lies at the foundation of all library legislation recognizes the fact that the free public library is and should be essentially a part of the system of public education in the state. The states, forming the Union, yearly spend millions upon millions of dollars in the maintenance of their common school systems; although, as we are informed, the average school life of our children is but 4.65 years, or less than one-half of the recognized school age. If such vast sums are spent for laying only the simplest rudiments of an education, how much more fitting that the state itself should also appropriate large sums for the support of free public libraries to supplement the work scarcely even begun in the common schools?

In Mr. Barnard's suggestion (and he certainly was a man far in advance of his time), as well as in the law itself, we see what has come to be one of the most important of our latter-day library principles — the closest relationship between the public library and the schools.

Mr. Barnard, also, in language which for lucidity and brevity cannot be excelled, gives us the best possible description of the work of branch libraries and delivery stations and also of that later offspring of library development, the travelling library. There is, furthermore, everything to favor, and nothing to discredit, the belief that open shelves were also one of the principal features of the school district library.

We have moreover, in clearly enunciated language, the purpose of the founders of these libraries that they were more especially created for the benefit of those who have finished their common school education rather than for the pupils only of the public schools. If this means anything, it means the promotion of Adult Education.

And finally we have foreshadowed the idea to which the latest form of legislation is tending — compulsory library laws as a natural concomitant of compulsory education.

Returning to the time before the law of 1835 had begun to meet with
eneral acceptance, we find in an article by Robert B. Patton of New York
ity, in the "American Biblical Repository" for January, 1853, an enlighten-
ng view of the library field as it existed at that time. Speaking of the
ibraries of his city and comparing them with those of other cities he says:
The whole number of volumes contained in all the public libraries of the
nited States, form . . . about half the number contained in the libraries of
aris, viz., 1,333,000, and the city of Lyons alone can boast of nearly as
any volumes in its public libraries, as would be furnished by all the public
braries of the twenty-six United States. Again, the public libraries of
e city of New York collectively, amount to 69,500 volumes. If these
9,500 volumes were brought together assorted and arranged, rejecting
uplicates, etc., in order to form one library, it would numerically not
uch exceed the single library of Harvard University. Again, it appears
at all the public libraries of the city of New York will furnish about
e-ninth part of the number of libraries in the city of Lyons; with which,
point of population and devotion to manufactures and commerce, a com-
arison may be instructively made; and not one-half as many volumes as
re contained in the public libraries of Marseilles, an enterprising commercial
ty, with a population one-half as great as that of New York." Notwith-
anding the unfavorable light in which the libraries of New York City were
aced by this comparison, the writer had faith that the energy of our people,
ould, in time, remove this stigma. Could he have lived to the present day
926) and seen thirty libraries in this state with 50,000 volumes or more,
ch, and twenty-eight others with 100,000 volumes or more, he would have
alized most fully the justness of the estimate he placed upon the American
aracter when he penned the following words: — "It must, therefore, be
knowledged that another distinguishing trait of American character is the
rivalled promptness and rapidity with which even the largest plans are
rried forward to their accomplishment. The interval between the con-
ption and the execution, usually filled up with doubts, and fears, trials and
ilures, hopes and anxieties, is here almost annihilated by the absorbing
ergy with which we press forward to the consummation."

But the twelve years which intervened before 1850 were to work a great
ange in the library field in this state. The close of the first half of the
ntury saw here, including academic and school district libraries, a total of
080 libraries, with an aggregate collection of 1,756,254 volumes, or nearly
e-half out of a total in this country of 9,505 libraries containing in all
753,964 volumes.

During the second quarter of a century from 1825–1849 there were established in the state fifty-six new libraries. Seventeen of these now have 10,000 volumes or more, of which four contain more than 40,000 volumes. They are the New York Law Institute Library, 1828; Buffalo Library, 1836; Union Theological Seminary Library, 1836; Astor Library, 1849; New York Academy of Medicine, 1847.

Libraries Founded From 1850 – 1874

We are now approaching a period in which there was a more general awakening of library interest and during which the principle of taxation for the support of free public libraries was to be carried a step further than under the law creating school district libraries. It had been found that the promoters of these libraries had made their unit too small; and that a proper selection of books for, and supervision of these libraries, were wanting. It was then, that the profound wisdom of Mr. Barnard's recommendation came to be recognized and the town instead of the school district was adopted as the unit. In consequence of this change, the public library movement entered upon a career which has continued to advance with ever-increasing strides from that day to this.

Time and space fail us to enter into the details of this period. We must be content to mention some of the factors which were potent in advancing the cause of free public libraries. In England were the two Parliamentary Committees, one on Public Libraries and the other to inquire into the Management of the British Museum, the reports of which are excellent reading even to-day. In this country we must not fail to mention the founding of the Astor Library and the work, then already under way by Mr. James Lenox, who had already begun the formation of that unparalleled collection which still bears his name, though now, like the Astor Library, forming a part of The New York Public Library. Mr. Charles C. Jewett, Librarian of the Smithsonian Institution was bending all his energies to the cause, and to him we are indebted for his valuable report entitled, "Notices of Public Libraries in the United States," his work on the "Construction of Library Catalogues," and the Library Conference of 1853, of which he was the leading spirit. It is not unlikely that his reputation will occupy a more prominent position in our library annals a century hence than it does to-day. If such is the case, it may well be predicted that it will be owing to his original scheme of forming at the Smithsonian Institution a great Central Bibliographical and Cataloguing Bureau. As our libraries become larger and the product of the rinting press increases in overwhelming magnitude, the necessity of some uch institution will come more and more to be recognized.

But let us return for a few moments to the School District Libraries of the tate and follow their subsequent career. It was during the early part of this eriod that the School District Libraries of New York reached high water-ark. In 1853 they numbered on their shelves the enormous aggregate of ,604,210 volumes. Their influence upon the public can never be fully easured. That they stimulated the formation of many public and private braries cannot well be questioned. How otherwise can we account for the act that during the decade from 1850–59 more public libraries were ounded than for the entire quarter of a century preceding? The salutary nfluence of these libraries is shown by a statement made in the Report of e Superintendent of Public Instruction, for 1889. He says: — "It is the ommon and grateful testimony of our native adult population that the istrict library was of priceless advantage to them and that it exerted an nlightening, broadening, and elevating influence upon society unequalled y any other educational enterprise ever undertaken here."

But evil days were in store for the school district libraries. Pernicious gislation, which had permitted the diversion of library money to other urposes, interfered with their healthful development. Unfortunately for e state, which had been the pioneer in establishing the principle of public raries supported by public taxation and had fostered them with state aid, e very fact that these libraries had been for a time so successful stood in e way of a change to the free town library system which was now beginning be acted upon in other states. And here it may not be amiss to state some the reasons why this, the school district library movement, begun under ch favorable circumstances and quite in advance of the times, came to fall to neglect and decay. As already intimated, the option given the school stricts to divert library moneys to the payment of teachers' salaries, after library of a certain size had been formed in each district, was the cause of eir downfall. Nor was this all. The state was growing rapidly. The umber of school districts had increased from 9,865 in 1834, to 11,587 in 52. As a result the amount received for library purposes became too small r each pupil so that it was utterly impossible to keep the libraries up to their int of usefulness or even to replace worn-out books. New books are as portant for the healthful support of a reading public as is fresh air for our lungs. The lack in either case causes asphyxiation, and results in death no less to one than to the other.

Viewed in the light of more recent experience, we find that the principal elements of weakness in the system were: —

1. The district was too small a unit.
2. There was lack of restraint and direction in the selection of books.
3. There was no suitable provision made for their shelving, supervision, and care.
4. The amount received became so small as to be wholly inadequate for their healthful growth.
5. Pernicious legislation helped to break down rather than build up, by permitting funds to be diverted to other purposes.
6. There was no increase of the state appropriation to meet the growth and increasing needs of the libraries.

The libraries continued to decrease in numbers until 1884, notwithstanding the $50,000 annually appropriated by the state for their support. In that year they numbered but 701,437 volumes. In 1893 a law was passed correcting the evils which had previously existed and from that time onward they have increased in size. In 1896 they had increased to 998,896 volumes or nearly 300,000 volumes in twelve years.

During the period from 1850–1874 one hundred and eighty-nine libraries were founded. Of these, seven now contain more than 40,000 volumes each, and twenty-six have from 10,000 to 40,000 volumes each. Among the most important of the larger ones may be named the: Y. M. C. A. Library of New York, 1852; Brooklyn Library, 1857; The Grosvenor Library, Buffalo, 1859; Long Island Historical Library, 1863; Cornell University Library, 1868; The Lenox Library, 1870; Syracuse University Library, 1872.

The third great library revival took place in 1876. The history of this is of too recent a date and too well known to be repeated here. Many factors which, as we have seen, had been quietly at work for years previous, were brought into prominence by the general activity of the centennial year.

THE LIBRARIES OF NEW YORK STATE TO-DAY

From what precedes we learn that New York, as a state, was very early an important factor in the library development of this country. It may not be out of place to consider here the resources of her libraries at the present time. By so doing we shall realize their phenomenal growth.

The statistics that follow show the increase since the beginning of the resent century. They are based on the *Handbooks* of the New York Library lub (1902 and 1922) and Patterson's *American Educational Directory* for 926 (vol. 23).

The present writer, as Chairman of a Committee appointed about 1900 to repare a Handbook for the New York Library Club, compiled a list of the ibraries in Greater New York. This list was published as part of the Club's andbook in 1902, and was prepared to serve as a record of the history, egulations, and resources of all the libraries existing at that date.

The Handbook of the Club issued in 1922, twenty years later, followed e general plan of its predecessor. The two have been used as a basis for a mparison between these libraries in 1902 and in 1922.

Patterson's *Educational Directory* has been used for statistics of libraries f 50,000 volumes or more outside of New York City.

From these combined sources we ascertain that there are 56 libraries in the ate of 50,000 volumes or more each, containing in the aggregate 11,805,425 olumes. In 1922 there were in New York City 212 libraries of less than 0,000 volumes each, containing in all, 1,753,412 volumes. This brings the tal number of volumes in the state up to 13,558,837. It should be borne mind, however, that these figures take no account of libraries outside of ew York City not included in the list that follows. Even so, there are ough books recorded here to fill more than 250 miles of shelving, allowing n volumes to the foot.

The Handbook of 1902 credits the libraries of Greater New York ith possessing 4,575,196 volumes; that of 1922 increases the number to 477,753. This brings to light the astonishing fact that these libraries have t only doubled the number of their volumes in the twenty years between 02 and 1922, but have added 327,361 volumes more than enough for that rpose.

Astounding as this statement is, it falls far short of telling the whole ory. No account is here taken of pamphlets (volumes in embryo) of which ery library possesses more or less — nine, alone, of the libraries mentioned ove reporting 376,000. Nor should we ignore many large collections of ner valuable matter, such as broadsides, prints and engravings, maps, music, otographs, indexed collections of clippings, etc., etc.

The mass of information contained in the New York Library Club's andbooks is enhanced by an exhaustive, alphabetical index of many special lections. This feature is of the greatest value to local scholars and should more generally known than we fear it is.

The following list* contains the names and number of volumes in all the libraries of the state that contain over 50,000 each:

PLACE	NAME OF LIBRARY	NUMBER OF VOLUMES
Albany	New York State Library	622,000
Albany	Public Library	78,000
Aurora	Wells College, Cleveland Library	53,431
Binghamton	Public Library	58,298
Buffalo	Grosvenor Library	192,000
Buffalo	Public Library	485,871
Clinton	Hamilton College	112,000
Geneva	Hobart College	80,000
Hamilton	Colgate University	110,000
Ithaca	Cornell University	750,000
Mount Vernon	Public Library	62,093
New Rochelle	Public Library	59,709
New York	American Geographical Society	57,210
New York	American Museum of Natural History	100,000
New York	Association of the Bar of the City of New York	131,964
New York	Brooklyn Public Library	956,051
New York	College of St. Francis Xavier (Patterson)	80,000
New York	College of the City of New York	70,000
New York	Columbia University	900,000
New York	Columbia University, Law Library	91,000
New York	Columbia University, Teachers' College	72,000
New York	Cooper Union	50,745
New York	Engineering Societies	150,000
New York	Fordham University	100,000
New York	General Society of Mechanics and Tradesmen	92,000
New York	General Theological Seminary	65,000
New York	Hispanic Society of America	100,000
New York	Jewish Theological Seminary	65,000
New York	Long Island Historical Society (Brooklyn)	90,000
New York	Medical Society of the County of Kings	76,000
New York	Mercantile Library Association	200,000
New York	New York Academy of Medicine	120,000
New York	New York Board of Education (libraries)	524,640
New York	New York Historical Society	137,000
New York	New York Law Institute	92,048
New York	The New York Public Library (libraries)	2,630,129
New York	New York Society Library	120,000
New York	New York University	89,554
New York	Pratt Institute Free Library (Brooklyn)	125,000
	Brought forward	9,948,743

---

* It should be remembered that many of these figures are for the year 1922. — Editor, Bulletin.

PLACE	NAME OF LIBRARY	NUMBER OF VOLUMES
	Carried forward	9,948,743
ew York	Queens Borough Public Library (Jamaica)	300,000
ew York	Union Theological Seminary	150,000
iagara Falls	Public Library	55,000
ughkeepsie	Adriance Memorial Library	64,553
ughkeepsie	Vassar College, Thompson Memorial Library	140,918
chester	Public Library	158,087
chester	Reynolds Library	90,565
chester	Rochester Theological Seminary	51,834
chester	Rochester University	120,000
henectady	Free Public Library	66,037
henectady	Union College	62,200
racuse	Public Library	173,534
racuse	Syracuse University	120,438
roy	Public Library	57,099
tica	Public Library	110,296
est Point	West Point Military Academy	61,406
nkers	Public Library	74,715
	Total	11,805,425

New York	7,735,341
Other Cities	4,070,084
Total	11,805,425

LIBRARIES OF GREATER NEW YORK

	1902		1922		
SIZE	NUMBER OF LIBRARIES	NUMBER OF VOLUMES	NUMBER OF LIBRARIES	NUMBER OF VOLUMES	GAIN OR LOSS
1 – 5M Vols.	169	304,618	104	192,959	— 111,659
5M– 10M Vols.	45	288,535	51	308,345	+ 19,810
0M– 20M Vols.	20	261,523	33	444,007	+ 182,484
0M– 30M Vols.	7	168,397	11	333,464	+ 165,067
0M– 40M Vols.	4	165,670	8	260,600	+ 94,930
0M– 50M Vols.	3	125,000	5	214,037	+ 89,037
0M–100M Vols.	11	746,275	13	979,557	+ 233,282
0M Vols. and more	9	2,515,178	16	6,744,753	+ 4,229,606
Total	268	4,575,196	241	9,477,753	+ 4,902,557

JOHN GREENWOOD, ARTIST, AND THE ISAAC JOHN GREENWOOD COLLECTION

THE strongly specializing collector of prints is a man after a curator's own heart, — particularly if his collection ultimately falls into the curator's hands. He puts into his task an amount of energy and persistence which is usually beyond the power of any one institution or its director. In the case of this Library's print room that condition, that combination of the collector's *flair* and public spirit, brought gifts from S. P. Avery (unrivaled collections of prints by Manet and others), J. Harsen Purdy (the engravings of Wm. Faithorne), Amos F. Eno (New York City views), J. L. Cadwalader (mezzotints), Cyrus J. Lawrence (lithographs by Daumier), and others. Each of these gifts, — and but a few have been cited here by way of illustration — put the print room at once into possession of a noteworthy collection in some specialty of the field of prints.

This happy condition has arisen again through the recent gift, by the children of the late Isaac John Greenwood, and in his memory, of the collection of prints formed by him. The central point of this collection is a group of mezzotints by John Greenwood. These have a peculiar interest as Americana. John Greenwood was born in Boston in 1727, went to Surinam, then to Holland, and finally to England, where he died in 1792. D. M. Stauffer has a biographical sketch of him in his "American Engravers," and informs us that he did no engraving in his native land. J. Chaloner Smith's "British Mezzotinto Portraits" lists nine prints by him, all portraits, in accordance with the scope of the book. But Greenwood mezzotinted also a number of reproductions of Dutch and other figure pieces. Some of these are listed in the Thieme-Becker "Kuenstler Lexikon," which offers also a bibliography of Greenwood. And now comes this collection, assiduously brought together by Isaac John Greenwood, affording a comprehensive view of the activity of this artist of American birth and European record.

These prints by John Greenwood will be on exhibition in Room 316, during December to February (inclusive), together with a drawing by Greenwood, a mezzotint ("Thomas Prince") after Greenwood by Peter Pelham (who reversed Greenwood's action by coming from England to America to live and work), and some other material illustrating Greenwood's activity, — even a sale catalogue or two issued by him when he had abandoned the practice of art for the business of an auctioneer of art objects. The whole forms in a measure a reconstitution of an eighteenth century nerican artist, working under the influence of the British portrait painters his time, but also of the earlier painters of Holland, in which country he udied for some time.

John Greenwood's work formed the main object of this collector's quest. ut he did collect other material, and a selection from that is also shown. ost noteworthy is J. R. Smith's three-quarter-length mezzotint portrait of njamin Lincoln, published in Boston in 1811 and not listed in Frankau's talogue of Smith's plates. There are some not too familiar bits of Americana, among them M. Swett's two views of Niagara and his portrait of Sam ouston. A number of D. C. Johnston's etched "Scraps" are here, J. T. nith's etchings of "Beggars," and some "peep-show prints," of which last e collection includes over seventy.

There is still more in this gift, — eighteenth century French line engravgs, British caricatures, Cruikshank's "Falstaff" set, wood engravings by P. Avery, lithographs, mezzotints, — a miscellaneous lot, with amusement d interest and surprises for him who delves, particularly if he has subject terest in view.

One goes back to the outstanding fact of the rehabilitation, so to speak, of hn Greenwood. And that forms a "memorial," indeed, to the zeal of ac John Greenwood. F. W.

SIR FRANCIS SEYMOUR HADEN AS A COLLECTOR

A RECENT GIFT FROM EDWARD G. KENNEDY

WHEN the late Samuel P. Avery presented to this Library, in 1900, his unrivaled collection of nineteenth century French and other etchings, that specialty in prints, especially in the directions in which he had aimed at completeness, seemed almost closed to any farther opportunity here. Mr. Avery had skimmed the cream, ahead of the others. People then were not generally hunting for the etchings of Corot, Meryon, Daubigny, and the rest. In the case of a number of these artists he managed to get a practically complete collection, as witness Bracquemond, Mauve, Manet, and others.

Yet the Library has actually been enriched on various occasions, by gift, in the very field in which Mr. Avery had built up so fine a collection. For example, the series of Storm van 'sGravesande's etchings was considerably augmented by a gift from Mr. Howard Mansfield; the book-plates by C. W. Sherborn were increased nearly five-fold through additions by the artist's son, Mr. C. Davies Sherborn; Daumier's lithographs grew from ten to about eighty times that number by the receipt of the collection formed by the late Cyrus J. Lawrence; similarly, additions were made to the portfolios of Gavarni (by Mrs. Schuyler Van Rensselaer), Legros (by Mr. Edward D. Adams), and to the lithographic section generally (by the accession of the collection formed by the late Joseph Pennell when writing his book on lithography).

This year there came a most noteworthy addition to our collection of nineteenth century European prints. Mr. Edward G. Kennedy presented 335 etchings from the collection of Sir Francis Seymour Haden. The French ones among these supplement the Avery gift in a surprising and gratifying manner. For example, the collection of Bracquemond's etchings, possibly exceeded or even equaled in extent or importance by only one museum, has now been increased in number by prints or states not in the Avery portfolios. The work of other artists is similarly augmented, particularly in cases where Mr. Avery intentionally procured only a few examples in order to illustrate an artist's style and subjects: Goncourt, Lançon, St. Etienne, Hervier, and others.

In the British section, besides a number of proofs of Victorian etchings, including some by Cope, Hook, and Redgrave, printed by Haden himself, there is especially a set of prints done by Thomas Huson in etching and mezzotint, as was Turner's famous "Liber." The similarity is solely one of hnique, not of subject and spirit. And the interest is primarily technical, d rests on this artist's continued use of mezzotint as a means of original pression. Mezzotinting has served almost entirely as a medium for the production of paintings, and its employment as a "painter art," as a direct eans of expression for the artist, is rare. There is here, too, an unpretentious hing by an American, John Henry Hill, — "The Village Church, Rock- nd County, New York." It was at West Nyack, in that county, that Hill, rmer and artist, lived for many years, as his father had before him. The ther was John William Hill, painter, one of our American group of e-Raphaelites. His father, in turn, was John Hill, known as an aquatint graver by his work for the "Hudson River Portfolio" and other pub- ations. (All three are well represented in the Library's large collection of nerican prints.)

Finally, the group of Dutch and Belgian artists finds accessions in the rk of Leys, Hillemacher, and others. Especially notable are some etch- ts by Jongkind, of whose work on copper the Avery Collection already had ne showing, supplemented by some original water-colors by that artist.

A selection of prints from this most recent, and most interesting, gift made Mr. Kennedy will be on view in Room 316 during December, January d February.

F. W.

NEWS OF THE MONTH

GIFTS

DURING the month of November, 1926, there were received as gift 4,585 volumes, 9,579 pamphlets, 12 maps and 5 prints. Some interesting and important items were the following:

From Sig. Riccardo Gualino, Milan, came a copy (No. 250 of 350 printed 1st March, 1926) of "La Collezione Gualino per Lionello Venturi," Torino 1926 (V. 1) — on the verso of fly-leaf is printed "Questa copia appartien alla New York Public Library."

Mr. R. R. Bowker presented a copy of "Ancient Deeds belonging to th Corporation of Bath XIII–XVI Cent., translated and epitomised by th Rev. C. W. Shickle . . . Published by the Bath Records Society in co-operatio with the Bath City Council, 1921."

From Mr. Morris Gisnet came 25 manuscripts of plays performed on th Yiddish stage in New York but not published; in all, 20 volumes and 2 pamphlets.

Mr. Alfred F. Goldsmith gave the Library a collection formed by Alfred Becks, consisting of prompt books of old plays, lithographs and engraving of theatrical celebrities, play-bills, clippings relating to the dramatic work produced in Boston during the period, 1896–1905, and other material.

Gen. William Barclay Parsons gave a copy (No. 90 of 100 printed) of "Erhard Etzlaubs Reisekarte durch Deutschland aus dem Jahre 1501; ein Karte der Fruehrenaissance, mit einem Begleittext von Prof. Dr. W. Wolkenhauer," Berlin, 1919.

From Mr. George T. Plowman, Cambridge, Mass., came four of hi etchings — "Old Mill, Oxford," "The Covered Bridge, Deerfield, Mass.," "Mt. Ascutney, N. H.," "Nevers, France — The Cathedral from across th Loire."

The Rev. Charles L. Short, Worcester, Mass., presented a drawing, bein the portrait of A. T. Stewart, drawn by a clerk in the store and purchased by Mr. Short at the time.

From the Society of Friends of Roumania, Incorporated, New York City, came a copy of the "Bulletin dedicated to Her Majesty Queen Marie of Roumania, October 18, 1926, by the Society of Friends of Roumania, William Nelson Cromwell, President."

From The Windsor Press, San Francisco, came a copy (No. 71 of 20 printed) of "The Most Pleasant and Delectable Tale of the Marriage of upid and Psyche as set forth by Apuleius in the Golden Ass and here made to the Printed Book by the Brothers Johnson at the Windsor Press . . . n Francisco, 1926.”

From M. Édouard Champion, Paris, came a copy (No. 125 of 700 inted) of “Paroles d'Amérique par Henry Bérenger” [Abbeville, 1926]. rom Mr. Dan Drumheller, Jr., and Family, Spokane, Wash., came a copy “ ‘Uncle Dan’ Drumheller Tells Thrills of Western Trails in 1854, by ncle Dan’ Drumheller,” Spokane, 1925. From the Pocumtuck Valley emorial Association, Greenfield, Mass., came a copy (one of an edition of 5) of the “History and Proceedings of the Pocumtuck Valley Memorial sociation 1912–1920, Vol. 6,” Deerfield, 1921. From the Rev. Thomas olf, Carrolltown, Pa., came a copy of “The Benedictine Fathers in Cam- ia County, Pa.,” by the Rev. Modestus Wirtner, O.S.B. [c. 1926.]

Collections of material were received from the following persons: Mr. ank L. Cooke (34 volumes of the Yucatan Diario Oficial, 1915–1917); e Engineering Societies Library (482 volumes, 642 pamphlets); Mr. A. gene Kirby (4 volumes, 23 pamphlets); Dr. J. H. Mittleman (6 vol- es, 453 pamphlets, 15 newspapers); National City Financial Library 82 volumes, 151 pamphlets, 61 periodicals); National Civic Federation volumes and 37 pamphlets); Mr. Walter W. Pettit (38 Russian pam- lets); Mrs. C. Schwarz (54 volumes, 8 pamphlets); Dr. Isidor Singer 5 volumes, 2 pamphlets); “Toc H” (To Conquer Hate), The Registrar, ndon (2 volumes, 17 pamphlets).

ADDITIONS AND USE OF THE LIBRARY IN NOVEMBER, 1926

DURING the month of November, 1926, there were received at the Library 28,368 volumes and 10,834 pamphlets. (These include the ditions to both Reference and Circulation Departments.) The total num- of readers recorded in the Central Building was 153,353. Visitors to the lding numbered 318,088.

NEW PERIODICALS

American Association of Industrial Physicians and Surgeons. Bulletin. Chicago, Ill. Monthly.

Ammla. New York. Quarterly.
Published by the American Merchant Marine Library Association.

Anthroposophy. London. Quarterly.

Antioquia (department), Colombia. — Dirección Gral. de Caminos. Boletín de caminos. Medellin, Antioquia, Colombia. Monthly.

Argonaut. Moscow, Idaho. Irregular.
Published by the Idaho University Associated Students.

Associated contractor. Worcester, Mass. Monthly.
Published by the Associated Contractors of Massachusetts.

Association de documentation industrielle et commerciale. Information de statistiques. Paris. Irregular.

Beau. New York. Monthly.

Bibliografia fascista. Roma, Italy. Monthly.

Bolivia. — Administración del Prefecto y Comandante General. Boletín departmental. La Paz, Bolivia. Thirty-six numbers a year.

Bremer wissenschaftliche Gesellschaft. Schriften. Reihe D. Bremen, Germany. Irregular.

Cambridge Philosophical Society. Proceedings. Biological sciences. Cambridge, England. Irregular.

Centro de commercio de café do Rio de Janeiro. Boletim mensal. Rio de Janeiro, Brazil. Monthly.

China law review. Shanghai, China. Quarterly.
Published by the students of the Comparative Law School of China at Soochow University.

Christiaan Huygens. Groningen, Netherlands. Bi-monthly.

Chronicle. New York. Semi-monthly.
Organ of the Central Trades and Labor Council of Greater New York and Vicinity.

Chronique d'Égypte. Bruxelles, Belgium. Semi-annual.

Claridad. Quito, Ecuador. Bi-monthly.

Colombia. — Departamento de Contraloría: Sección 8a, Estadística General. Boletín estadístico de Colombia. Bogotá, Colombia. Irregular.

Committee on Militarism in Education News letter. New York. Irregular.

Constitutionalist. Shanghai, China. Monthly.
Published by the Constitutional Defence League.

Continental metallurgical and chemical engineering. Berlin. Monthly.

Co-operative review. Manchester, England. Bi-monthly.

Cornell University. — Engineering College. Bulletin of the Engineering Experiment Station. Ithaca, N. Y. Irregular.

Cuba. — Secretaría de Obras Públicas. Boletín de obras públicas. Habana, Cuba. Monthly.

Current thought. Madras, India. Monthly.

Douglas "20". San Francisco, Cal. Monthly.
Official publication of the San Francisco Police Department.

Éducation-récréation. Brussels, Belgium. Monthly.
Organ of the Centrale d'éducation ouvrière.

Die **Einheit.** Berlin, Germany. Semi-monthly.

Electric refrigeration news. Detroit, Mich. Semi-monthly.

English and amateur mechanics. London. Weekly.

Florida investor. Miami, Fla. Monthly.

Florida realty journal. Orlando, Fla. Monthly.
Published by the Florida Association of Real Estate Boards.

Fondation universitaire. — Cercle des alumni. Bulletin. Brussels, Belgium. Monthly.

Fore and aft. Toronto, Ont. Irregular.
Published by the Toronto Public Library.

Georgia. — Highway Department. Georgia highways. Atlanta, Ga. Monthly.

Golos minuvshavo na chuzhoi storonye. Paris. Bi-monthly.

Gosudarstvennyi dal'nevostochnyi universitet. Trudy. Vladivostok, U.S.S.R. Irregular.

Grace notes. New York. Quarterly.

Hacefira. Warsaw, Poland. Daily.

Hannoar we-Haaretz. Tel-Aviv, Palestine. Bi-monthly.

Hillel news. Ann Arbor, Mich. Semi-monthly.
Published by the Michigan University B'nai B'rith Hillel Foundation.

Humanity magazine. New York. Monthly.

Immortality. New York. Monthly.

Import-export. Bucarest, Rumania. Weekly.

Indian Chemical Society. Quarterly journal. Calcutta. Quarterly.

Industrial finishing. Indianapolis, Ind. Monthly.

Information Bureau on Women's Work. [Bulletin.] Toledo, Ohio. Monthly.

International Geodetic & Geophysical Union. — Section de Géodésie. Bulletin géodésique. Paris. Quarterly.

Ipswich library journal. Ipswich, England. Quarterly.

Irkutsk. — Gosudarstvennyi universitet: Biologo-geograficheski institut. Izvestiya. Irkutsk, U.S.S.R. Irregular.

Joliet civic news. Joliet, Ill. Weekly.
Published by the Joliet Chamber of Commerce.

Latvijas Universitate. Botaniska Darza Raksti. Riga, Latvia. Three times a year.

Lotnik. Poznan, Poland. Weekly.
Published by the Związek Lotników Polskich.

Magazine dealer and distributor. New York. Monthly.

Magazine égyptien. Cairo, Egypt. Semi-monthly.

Manuscrit autographe. Paris. Bi-monthly.

Mayfair. New York. Semi-monthly.

Mental science. New York. Monthly.

Mexico. — Ministro de Guerra y Marina. Revista del Colegio Militar. Popotla, Mexico, D. F. Monthly.

Modern language journal. Menasha, Wis. Monthly from October to May.
Published by the National Federation of Modern Language Teachers.

Modern world. Baltimore, Md. Monthly.

Nauchnoye obshchestvo po izucheniyu votskovo kraya. Trudy. Izhevsk, U.S.S.R. Irregular.

Needle worker. New York. Monthly.
Published by the Trades Union Educational League, Needles Trades Section.

New York Evening Enquirer. New York. Weekly.

North German Lloyd gazette. New York. Quarterly.

Ohio State University. — College of Commerce and Journalism. Bulletin of business research. Columbus, Ohio. Monthly.

Old master drawings. London. Quarterly.

La **Paix** par le droit. Nîmes, France. Monthly.
Published by the Association de la paix par le droit.

Panama. — Asamblea Nacional. Diario de los debates. Panama, R. P. Daily.

Pax international. Geneva, Switzerland. Monthly.
Published by the Women's International League for Peace and Freedom.

La **Pensée** française contemporaine. Paris. Bi-monthly.

Q S T français et Radioélectricité réunis. Paris. Monthly.

Radio Club of America. Proceedings. New York. Monthly.

Raspored Radiostanice Zagreb. Zagreb, Jugoslavia. Weekly.

Rayon journal. New York. Monthly.
Published by the Textile Reporting Corporation.

Risorgimento grafico. Milano, Italy. Monthly.
Organ of the Amatori del libro.

Roczniki chemji. Warsaw, Poland. Irregular.
Published by the Polskie Towarzystwo Chemiczne.

Ryazan. — Obshchestvo issledovatelei ryazanskavo Kraya. Vestnik ryazanskikh krayevedov. Ryazan, U.S.S.R. Irregular.

Schweiz-Konsum-Verein. Basel, Switzerland. Weekly.
Organ of the Verband schweizerische Konsumvereine.

Science et industrie. Paris. Monthly.

Severo-kavkazski krai. Rostov-na-Donu, S.S.S. R. Monthly.
Published by the Severo-Kavkazskaya Krayevaya Planovaya Komissiya.

Siebel technical review. Chicago, Ill. Quarterly.
Published by the Siebel Institute of Technology Alumni Council.

Signs of the times. Middletown, N. Y. Monthly.

The **Speaker.** New York. 10 issues a year.

Sputnik politrabotnika. Moscow, S.S.S.R. Irregular.
Published by Voyenno-nauchnoye obshchestvo.

Stroitel'naya promshlennost'. Moscow, S.S.S.R. Monthly.

Szkoła specjalna. Warsaw, Poland. Quarterly.
Published by the Zwiazek Polskie Nauczycielstwa Szkol Powszechnych. Sekeja Skolnictwa Specialnegprzy.

Telegrafiya i telefoniya bez provodov. Leningrad, S.S.S.R. Irregular.

This week in Sarasota. Sarasota, Fla. Weekly.

Toc H journal. London. Monthly.

Het **Tooneel.** Antwerp, Belgium. Weekly.

Triad. Sydney, N. S. W. Monthly.

Ukraine. — Tzentral'ne Statistichne Upravlinnya. Statystychna khronika. Kharkov, U.S.S.R. Semi-monthly.

University of Missouri. University of Missouri studies. Columbia, Mo. Quarterly.

Vojo de klerigo. Kharkov, U.S.S.R. Monthly.
Organ of the Stata Scienca Metodologia Komitato de la Popola...

White Russia. — Gosudarstvennaya planovaya komissiya. Byulleten'. Minsk, White Russia, U.S.S.R. Irregular.

Will o' the wisp. Driver, Va. Bi-monthly.
Published by the Poetry Society of Suffolk, Va.

Worker. Toronto, Ont. Weekly.

Zeitschrift für Ortsnamen-Forschung. München, Germany. Three times a year.

INSULATING OIL
(1900–1925)

A LIST OF REFERENCES IN THE NEW YORK PUBLIC LIBRARY

COMPILED BY ARTHUR W. FYFE, JR.
Science and Technology Division

PART II
(Conclusion)

1914

188. **Brauen,** W. Über Transformatorenöl. (Chemische Revue über die Fett- und Harz-Industrie, Hamburg, Jahrg. 21, 1914, p. 138–139, 170–171.) **† VOA**

Condensed in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 32, 1914, p. 145–146, † *VGA.* Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 32, 1914, p. 381, † *VGA; Electrical world,* New York, v. 63, 1914, p. 497, † *VGA; Electrician,* London, v. 73, 1914, p. 431–432, † *VGA; Chemical abstracts,* Easton, v. 8, 1914, p. 1680–1681, *PKA; Society of Chemical Industry, Journal,* London, v. 33, 1914, p. 951–952, *VOA.*

Covers general requirements of transformer oils, and discusses the causes and nature of sludge formation, catalytic reaction with copper, loss of insulation value by absorption of moisture, and the importance of viscosity, a curve for which is given, showing the relation of viscosity to temperature of four representative oils. A comparison is made of the characteristics of mineral and resin oils; the latter is preferred on the basis of higher dielectric strength, oxidation products are soluble and do not attack the metal or other insulation, and water is not formed in the decomposition.

189. **Benischke,** Gustav. Die wissenschaftlichen Grundlagen der Elektrotechnik. Berlin: Julius Springer, 1914. 605 p. 3. ed. illus. 8°. **VGC**

p. 506–511: Insulating oil.

190. **Drying** transformer oil. (Electrical engineering, London, v. 10, 1914, p. 555.) **† VGA**

Describes a British Thomson-Houston filter-press.

191. **Garrard,** Charles C. Oil for electrical purposes. (Electrician, London, v. 73, 1914, p. 797–800.) **† VGA**

Abstracted in *Electrical world,* New York, v. 64, 1914, p. 776, † *VGA; Chemical abstracts,* Easton, v. 8, 1914, p. 3719, *PKA; Science abstracts,* London, v. 18–B, 1915, p. 56, *PAA.*

This paper takes into consideration the influence of moisture, and methods of drying; insulation and resistance qualities of oil and methods of testing therefor; flash point, specific gravity, and freedom from mineral impurities, acids and alkalies. A standard specification is given for transformer and switch oil.

192. **Insulating** oils and lubricants. (Electrician, London, v. 73, 1914, p. 902–903.) **† VGA**

Describes the physical characteristics of the Russian hydrocarbons which form the basis of the Stern Sonneborn Co. oil.

193. **Oil-testing** set. (Electrical world, New York, v. 64, 1914, p. 682–683.) **† VGA**

Same in *Electrical review,* Chicago, v. 65, 1914, p. 686, † *VGA; Journal of electricity,* San Francisco, v. 33, 1914, p. 396, † *VGA.*

General Electric type; 30,000-volt secondary.

194. **Pistoye,** H. de. Calcul de la surface de refroidissement des bacs de transformateurs immerges dans l'huile. (La Lumière électrique, Paris, série 2, tome 27, 1914, p. 65–68.) **† VGA**

Abstracted in *Science abstracts,* London, v. 17–B, 1914, p. 437, *PAA.*

Discusses methods for determining the cooling effect of a given arrangement of cooling surfaces.

195. **Schwaiger,** A. Über die Prüfung der elektrischen Eigenschaften von Isoliermaterialien. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 32, 1914, p. 481–485.) **† VGA**

Abstracted in *Electrician,* London, v. 74, 1914, p. 47–49, † *VGA; Chemical abstracts,* Easton, v. 9, 1915, p. 561, *PKA; Science abstracts,* London, v. 18–B, 1915, p. 337, *PAA.*

Advocates the use of smooth circular electrodes rather than flat ones, in order to prevent irregularities of surface from affecting the discharge. Characteristic curves for various sizes of circular electrodes are given.

196. **Schwarz,** F., and J. MARCUSSON. Die Untersuchungen der Dampfturbinenöle. (Mitteilungen aus dem Königlichen Materialprüfungsamt zu Berlin-Lichterfelde West, Berlin, Jahrg. 32, 1914, p. 496–502.) **VA (Prussia)**

Tests to determine the natures of resinous, tar, and coke impurities and the conditions which bring about the formation of acids and other oxydation products of mineral oils.

1914, continued.

197. Smith, William Harold, and J. B. Tuttle. Iodine number of linseed and petroleum oils. Washington: Government Printing Office, 1914. 17 p. diagrs. 4°. (United States. — Bureau of Standards. Technologic paper no. 37.) **VBDA**

"Suggestions are made for the standardization of the method of determining the iodine number of mineral oils. The necessity for such action is shown by the results on several samples of lubricating oils."

198. Testing the sludging of oils. (Electrician, London, v. 72, 1914, p. 662.) **† VGA**

Briefly describes a machine using ozone to determine the sludging properties of insulating oils.

199. Transformer oil dryers and filters. (Electrician, London, v. 74, 1914, p. 56–57.) **† VGA**

A British Thomson-Houston filter press is described.

200. Villemontée, G. Gouré de. Propagation de l'électricité à travers l'huile de paraffine. (Académie des sciences, Comptes rendus, Paris, tome 158, 1914, p. 1414–1416.) **OA**

Abstracted in *Science abstracts,* London, v. 17–A, 1914, p. 491, *PAA.*

Describes investigation of the laws governing the initial propagation of electricity through paraffin oil.

201. —— Propagation de l'électricité à travers l'huile de paraffine. (Académie des sciences, Comptes rendus, Paris, tome 158, 1914, p. 1571–1572.) **OA**

Abstracted in *Science abstracts,* London, v. 17–A, 1914, p. 491, *PAA.*

An extension of earlier work; see p. 1414–1416. In this paper results are given of the effect of the length of duration of the applied current.

202. —— Propagation de l'électricité à travers l'huile de paraffine. (Journal de physique, Paris, série 5, tome 4, 1914, p. 298–299.) **OA**

Abstracted in *Science abstracts,* London, v. 19–A, 1916, p. 298–299, *PAA.*

An extension of earlier work; see *Comptes rendus,* Paris, tome 158, 1914, p. 1414–1416 and 1571–1572.

203. Weiss, H. Oil-cooled transformers. (Electrical world, New York, v. 63, 1914, p. 1457.) **† VGA**

Briefly describes E. P. no. 24,162 (1913). A method whereby a transformer tank is kept under a pressure of oil automatically.

204. Wilson, G. O. A study of transformer oils. (Journal of electricity, San Francisco, v. 33, 1914, p. 224–226.) **† VGA**

After a brief history of the use of oil as an insulating and cooling medium, statement is made of the properties of oil required. Results are given of tests made by the author, covering flash point, deterioration, volatility, moisture content and dielectric strength, viscosity, specific gravity, acid and alkali per cent, sulphur and carbon per cent.

1915

205. Bouchet, L. Tensions électriques agissant à la surface d'une nappe isolante liquide. (Académie des sciences, Comptes rendus, Paris, tome 160, 1915, p. 554–557.) **OA**

Abstracted in *Science abstracts,* London, v. 18, 1915, p. 364, *PAA.*

The effect on vaseline, benzol and petroleum ether is studied with a suddenly applied potential of 5150 volts.

206. Chattock, R. A. The need for non-sludging oil. (Electrician, London, v. 75, 1915, p. 593–594.) **† VGA**

A letter describing, with illustration, a transformer that has become thickly coated with sludge. A change in oil was made and no further trouble was experienced.

207. Collis, A. G. Arc phenomena. (American Institute of Electrical Engineers, Transactions, New York, v. 34, 1915, p. 1921–1940; discussion, p. 1941–1951.) **† VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 37, 1916, p. 307–308, *† VGA; Science abstracts,* London, v. 18–B, 1915, p. 521–522, *PAA.*

This paper describes a number of experiments made to determine the influence of differently shaped arcing contacts upon the disturbance following rupture of an alternating-current circuit. Various theoretical considerations are discussed with a view to modifying the design of oil switches so as to increase their rupturing capacity and thereby eliminate auxiliary devices with their added complications and expense.

208. Digby, W. Pollard. Report on switch and transformer oils. (Institution of Electrical Engineers, Journal, London, v. 53, 1915, p. 146–156.) **VGA**

Same, condensed, *Electrician,* London, v. 74, 1915, p. 657–660, *† VGA; Electrical world,* New York, v. 65, 1915, p. 345–346, *† VGA.* Abstracted in *Science abstracts,* London, v. 18–B, 1915, p. 88, *PAA; Chemical abstracts,* Easton, v. 10, 1916, p. 965, *PKA; Society of Chemical Industry, Journal,* London, v. 34, 1915, p. 1133, *VOA.*

Summarized answers to a questionnaire sent to a number of manufacturing and operating companies; covers formation of sludge, and tests therefor; absorption of moisture; measurement of dielectric strength and specific resistance; thermal transference and the nature and effects of arcs in oil. Sludging is considered as a reaction between the unsaturated hydrocarbons in the oil and the oxygen in the air, and to result in the formation of complex organic acids, dehydrogenated hydrocarbons, and oxidized resinous asphaltones. Rate of sludge formation is increased with rising temperature; copper and lead appear to act as catalysts, sunlight hastened the action; sludging is independent of specific gravity and viscosity.

209. Fleischmann, L. Versuch einer Bestimmung der in Ölschaltern auftretenden Drucke. (Archiv für Elektrotechnik, Berlin, Bd. 4, 1915, p. 86–88.) **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 34, 1916, p. 50, *† VGA; Science abstracts,* London, v. 19–B, 1916, p. 67, *PAA.*

A method is described for determining the pressure generated in an oil switch upon operation which takes into consideration the arc current, the velocity of the switch contacts, and the dimensions of the oil tank; the method assumes that the oil completely fills a spherical vessel and that the energy of the arc changes one portion of the oil into overheated vapour at a uniform temperature and leaves the remainder of the oil at its original temperature.

1915, continued.

210. Gewecke, H., and W. von Krukowski. Elektrodengrösse und Durchschlagsspannung bei der Prüfung dünner Isolierstoffe. (Archiv für Elektrotechnik, Berlin, Bd. 3, 1915, p. 63–66.) **VGA**

Abstracted in *Science abstracts,* London, v. 18–B, 1915, p. 334, *PAA.*

Results of previous investigations (Farmer, *American Institute of Electrical Engineers, Transactions,* New York, v. 32, 1913, p. 2097–2110) indicate that the larger the electrode the smaller is the breakdown voltage. Experiments carried out by the present authors on paper and gauze in air and oil do not give corresponding results.

211. Grempe, G. M. Konservierung heissen Betriebsöls durch Luftabschluss. (Seifensieder-Zeitung, Augsburg, Jahrg. 42, 1915, p. 936.) **3 – VON**

Abstracted in *Chemical abstracts,* Easton, v. 10, 1916, p. 536, *PKA.*

212. Holde, David. Ueber die elektrische Erregbarkeit und Leitfähigkeit flüssiger Isolatoren (Benzin, Petroläther usw.). (Der Seifenfabrikant, Berlin, Jahrg. 35, 1915, p. 182–184, 207–209.) **† 3 – VOA**

Abstracted in *Chemical abstracts,* Easton, v. 9, 1915, p. 1389, *PKA.*

213. Klein, Josef. Erwärmungskurve selbstkühlender Öltransformatoren. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 33, 1915, p. 217–219.) **† VGA**

Abstracted in *Electrical world,* New York, v. 66, 1915, p. 298, † *VGA; Science abstracts,* London, v. 18–B, 1915, p. 422, *PAA.*

Determination of the heating curve of transformers, the windings and the tank containing the oil being treated separately. Results of measurements are compared with standard formulas, some inconsistency exists and a revised formula is offered. Formulas for tanks are applicable to oil switches.

214. Kock, F. Die elektrische Durchschlagsfestigkeit von flüssigen, halbfesten Isolierstoffen in Abhängigkeit vom Druck. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 36, 1915, p. 85–88, 99–102.) **† VGA**

Abstracted in *Electrical world,* New York, v. 65, 1915, p. 919, † *VGA; Science abstracts,* London, v. 18–B, 1915, p. 338, *PAA; Chemical abstracts,* Easton, v. 9, 1915, p. 1277, *PKA.*

The following liquids were investigated: transformer oils, castor oil, paraffine oil, petroleum, benzol and toluol; and the semi-liquids, yellow vaseline and paraffine. In the lower ranges of pressure, the perforation strength increases proportionally with the pressure, but at higher pressures, it increases less quickly. Curves show the difference of perforation strength with oil, boiled and filtered as against oil not so treated. Effect of frequency and wave form were also studied.

215. Lawson, C. S. The care of transformer oil. (Electric journal, Pittsburgh, v. 12, 1915, p. 188–191.) **VGA**

Abstracted in *Electrical world,* New York, v. 65, 1915, p. 1175, † *VGA.*

Considers the importance of determining dielectric strength, flash-point, viscosity and sludging characteristic of an oil before using. Discusses methods and equipment used for removing moisture.

216. Malclès, Louis. L'influence électrique dans une cellule à paroi isolante et à noyau liquide. (Académie des sciences, Comptes rendus, Paris, tome 161, 1915, p. 694–696.) **OA**

Abstracted in *Electrical world,* New York, v. 71, 1918, p. 814, † *VGA; Science abstracts,* London, v. 19–A, 1916, p. 128–129, *PAA.*

Vaseline, turpentine and petroleum between quartz plates are studied.

217. Muenzinger, Friedrich. Über den Schutz vor Ölschalterbränden durch neutrale Gase. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 36, 1915, p. 284–286.) **† VGM**

Abstracted in *Science abstracts,* London, v. 18–B, 1915, p. 344–345, *PAA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 33, 1915, p. 430, † *VGA.*

The author ascribes the explosion of an oil switch to one or both of the following causes: (1) the heat set free in the breaking arc, and (2) the heat which arises from the vaporization of the oil by the arc and its subsequent combination with air and its combustion. Oil switch explosions may therefore occur without actual combustion of oil vapors, but by pressure alone. Tests on two switches, one of which exploded, are described; the heat generated by the arc was five times greater than that which could have arisen by complete combustion of the gas. On the basis of the conclusion that the increased pressure alone may cause a tank to burst, the author concludes that the use of a neutral gas, or the total filling of the tank with oil, thus eliminating air, would afford no protection whatever.

218. Peek, F. W., jr. Dielectric phenomena in high voltage engineering. New York: McGraw-Hill Book Company, Inc., 1915. xv, 265 p. illus. 8°. **VGM**

p. 153–165: "Corona and sparkover in oil and liquid insulations."

Discusses effects of electrode size and shape, moisture, and temperature on dielectric strength; tabulated results of observations on sparkover between spheres, parallel plates, and concentric cylinders for no. 6 transil oil. Compares 60 cycle and impulse sparkover in oil and in air.

p. 180: "Variation of dielectric strength with thickness and number of layers. (One minute tests — 60 cycle — 10 cm. terminals in oil. Values effective sine wave)" for pressboard, treated wood, untreated paper, varnished cloth, hard rubber and mica.

p. 182: "Variation of insulation strength with time of applied voltage" for oil impregnated paper, 30 layers, 60 cycle, 10-cm. diameter disks.

p. 183: "Permittivity of insulating materials." Linseed oil and transil oil.

p. 184: "Comparative insulation strength for high frequency, impulse oscillation and 60-cycle voltages." Transil oil between flat terminals — square edge. 2.5-cm. diameter, 0.25 space."

p. 189: "Solid insulation barriers in oil." Effective Kv. for various sizes of gaps and for various numbers of 0.08 cm. sheets of pressboard.

219. —— The effect of transient voltages on dielectrics. (American Institute of Electrical Engineers, Transactions, New York, v. 34, 1915, p. 1857–1909; discussion, p. 1910–1920.) **† VGA**

The general laws of breakdown of dielectrics by transient voltages are summarized. The transient breakdown voltages for oil follow much the same laws as for air; except that the impulse ratio and the lag are much larger for gaps in oil. The use of spheres increases the impulse ratio and lag.

1915, continued.

220. —— Law of "corona" and spark-over in oil. (General Electric review, Schenectady, v. 18, 1915, p. 821–827.) **VGA**

Abstracted in *Science abstracts,* London, v. 18–B, 1915, p. 467–468, *PAA.*

"The author shows that the mechanism of breakdown in gaseous and liquid insulators is very much the same; the general laws which he has developed for air also apply to oil. These laws may be used in practice in calculating the breakdown voltages in oil. Data on the various properties of oil for 60 cycles, high frequency and impulse voltages are given."

221. **Quinn,** E. A. Proper care of transformers. (Journal of electricity, San Francisco, v. 34, 1915, p. 430–431.) **† VGA**

Considers methods of drying transformer windings and oil.

222. **Randall,** Karl C. Oil circuit breakers. Notes on arc phenomena and tendencies in design. (American Institute of Electrical Engineers, Transactions, New York, v. 34, 1915, p. 247–259; discussion, p. 260–268.) **† VGA**

Abstracted in *Science abstracts,* London, v. 18–B, 1915, p. 137, *PAA.*

An analysis of the nature of the arc formed under oil when an inductive or a non-inductive load is disconnected; particular importance is attached to the rapidity with which the oil is able to replace the arc and to dissipate the heat, gas and stress incident to the operation.

223. **Schreiber,** K. A. Materialprüfungsmethoden in Elektromaschinen- und Apparatebau. Stuttgart, 1915. xii, 285 p. illus. 8°. **VGC**

p. 228–248: Testing of transformer oil for water content, acidity, alkalinity, tar formation, flash point, cold point, and dielectric strength.

224. **Schwab,** Ernst. Transformatorenöle. (Seifensieder Zeitung und Revue über die Harz-, Fett-, und Öl-Industrie, Augsburg, Jahrg. 42, 1915, p. 100–101, 122–123.) **† 3 – VON**

Abstracted in *Zeitschrift für angewandte Chemie,* Leipzig, Jahrg. 28, 1915, II. Referatenteil, p. 191–192, *PKA.*

General discussion of the requirements of transformer oils, effect of presence of acid, alkalis, and moisture.

225. **Tank,** Franz. Über den Zusammenhang der dielektrischen Effektverluste von Kondensatoren mit den Anomalien der Ladung und der Leitung. ([Poggendorff's] Annalen der Physik, Leipzig, Folge 4, Bd. 48, 1915, p. 307–359.) **PAA**

Abstracted in *Science abstracts,* London, v. 19–A, 1916, p. 77, *PAA.*

Investigates the connection between the dielectric losses in condensers with solid and liquid dielectrics and the charging and conduction currents. The losses in liquid dielectrics were found to be due to ionic conduction, and to disappear if the dielectric is sufficiently purified.

226. **Value** of clean bottles for sampling transformer oil. (Electrical world, New York, v. 66, 1915, p. 589.) **† VGA**

227. **Weinberger,** A. Ölschalterexplosionen, deren Ursache und Verhütung. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 36, 1915, p. 157; discussion, p. 278–279, 284–286, 433–434.) **† VGA**

Abstracted in *Electrician,* London, v. 75, 1915, p. 883, † *VGA; Electrical world,* New York, v. 65, 1915, p. 1176, † *VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 33, 1915, p. 261, † *VGA.*

The author recommends two methods of preventing oil switch explosions: the first method consists in building switches air tight, and replacing the air with an inert atmosphere, nitrogen being suggested; the second method is to make the tank air and oil tight and to connect it by means of a pipe to an overhead oil reservoir. On the assumption that the explosion is caused by ignition of the oil fumes in the presence of air, the danger would be eliminated by either of these methods.

1916

228. **American Society for Testing Materials.** Standard test for loss on heating of oil and asphaltic compounds. Serial designation: D 6–16. (American Society for Testing Materials, Standards, Philadelphia, 1916, p. 533–534.) **VEE**

229. An **Oil** testing machine which gives true insulation comparison of oils. (Electrical world, New York, v. 68, 1916, p. 574–575.) **† VGA**

Describes the testing outfit developed by the Scheidel-Western X-Ray Co., which is designed to increase the testing voltage at the rate of 5-kv. or 10-kv. per second independently of the operator in order to overcome the difference due to time element.

230. **Bachmann,** R. Die thermischen Grundlagen der Ölkühlung elektrischer Apparate, insbesondere von Transformatoren. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 37, 1916, p. 263–264.) **† VGA**

231. **Bacon,** Raymond Foss, and W. A. HAMOR. The American petroleum industry. New York: McGraw-Hill Book Company, Inc., 1916. 2 v. illus. 8°. **VHY**

Paged continuously.

p. 803: Oxidation of mineral oils in transformers; p. 917: Requirements.

232. **Battle,** John Rome. Lubricating engineers handbook. A reference book of data, tables, and general information for the use of lubricating engineers, oil salesmen, operating engineers, mill and power plant superintendents and machinery designers, etc. Philadelphia: J. B. Lippincott Company, 1916. 333 p. illus. 8°. **VON**

p. 276: "Specifications for transformer oil." p. 277: Drying with metallic sodium, effect of moisture on dielectric strength. p. 308: Oil coolers.

233. **Bauer,** Bruno. Tests on oil switches. (Electrician, London, v. 76, 1916, p. 767–771.) **† VGA**

Condensed in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 37, 1916, p. 183–184, † *VGA.* Abstracted in *Science abstracts,* London, v. 18, 1915, p. 467, *PAA.*

Condensed form of first report of the commission on high-tension apparatus and fire protection of the Schweizerische elektrotechnische Verein und Verband schweizerische Elektrizitätswerke. A theoretical and mathematical study of the formation and maintenance of an arc under oil. Particular attention is paid to

1916, continued.

the arc voltage and current; the relation of total energy interrupted to the heat generated; wave distortion; relation of arc length to power factor; effects of reactance, material, size and design of contacts, and to multi-break switches compared to single-break.

234. —— Tests on oil-switches. (Electrician, London, v. 77, 1916, p. 588–591.) † **VGA**

Abstracted in *Science abstracts,* London, v. 19-B, 1916, p. 217–218, *PAA.*

Abstracted form of third report of commission on high-tension apparatus and fire protection of the Schweizerische elektrotechnische Verein und Verband schweizerische Elektrizitätswerke. Deals with the conditions which determine the magnitude of switch energy and methods for limiting the same.

235. Bearce, Henry Walter, and E. L. Peffer. Density and thermal expansion of American petroleum oils. Washington: Government Printing Office, 1916. 26 p. illus. 4°. (United States. — Bureau of Standards. Technologic paper no. 77.) **VBDA**

236. Can inflammable oil be eliminated from electrical apparatus. (Electrical review, Chicago, v. 69, 1916, p. 494–495.) † **VGA**

An editorial based on the work of Vogelsang (*Elektrotechnische Zeitschrift,* Berlin, Jahrg. 37, 1916, p. 153–155).

237. Dunstan, A. E., and F. B. Thole. The pyrogenesis of hydrocarbons. (Institution of Petroleum Technologists, Journal, London, v. 3, 1916, p. 36–112; discussion, p. 113–120.) **VHYA**

Same in (*Journal of Industrial and engineering chemistry.* Easton, v. 9, 1917, p. 879–902, † *VOA.*) Same, condensed, in *Engineering,* London, v. 102, 1916, p. 510–511, † *VDA; Chemical trade journal,* London, v. 59, 1916, p. 458, † *VOA.* Abstracted in *Chemical abstracts,* Easton, v. 11, 1917, p. 299, 3425, *PKA.*

Much information is given in tabulated form of the effects of various temperatures and pressures on hydrocarbons, many of which are used or have been experimented with as possible insulating mediums. Bibliography.

238. Grossman, H. Unverbrennliches Schalter- und Transformatorenöl. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 37, 1916, p. 124.) † **VGA**

Abstracted from *Schweizerische elektrotechnische Verein, Bulletin,* Bd. 5, p. 356.

Gives the properties of a mixture of 25% non-inflammable liquid of high dielectric strength and 75% transformer oil.

239. Institution of Electrical Engineers. — Research Committee: Sub-Committee on Insulating Oils. Insulating oils. (Institution of Electrical Engineers, Journal, London, v. 54, 1916, p. 497–504.) **VGA**

Condensed in *Electrician,* London, v. 77, 1916, p. 73–75, † *VGA; Mechanical engineer,* Manchester, Eng., v. 37, 1916, p. 327–331, † *VFA.* Abstracted in *Science abstracts,* London, v. 19-B, 1916, p. 252, *PAA; Chemical abstracts,* Easton, v. 10, 1916, p. 2633, *PKA; Electrical world,* New York, v. 67, 1916, p. 1316, † *VGA.*

In order to judge the suitability of an oil as a cooling insulating medium, it is necessary to know its characteristics in the following respects: (1) tendency to sludge; (2) loss by evaporation; (3) flash point; (4) viscosity at different temperatures; (5) chemical reactions; (6) density and coefficient of expansion; (7) cold test (solidification); (8) moisture absorption; (9) dielectric strength; (10) specific resistance; (11) thermal transference; (12) specific resistance. Detailed methods of testing for the above characteristics are described.

240. Lactroseal. (Electrical world, New York, v. 67, 1916, p. 1318–1319.) † **VGA**

Describes the nature and characteristics of this mineral oil developed by the Westinghouse Electric and Manufacturing Co., for insulating purposes.

241. Lyndon, Lamar. Hydro-electric power. New York: McGraw-Hill Book Company, Inc., 1916. 2 v. illus. 8°. **VGMB**

v. 2. Electrical equipment and transmission. p. 41: requirements of oil for transformers; p. 86: oil for oil switches.

242. Mackie, J. K. A simple test for moisture in transformer oil. (Electrical world, New York, v. 68, 1916, p. 958.) † **VGA**

Abstracted in *Electrical review,* London, v. 79, 1916, p. 694, † *VGA.*

Describes the method used by the Connecticut Power Company for indicating the presence of water in oil by the use of powdered anhydrous copper sulphate which produces a blue coloration in the presence of moisture.

243. Marvin, R. H. A source of error when using the sphere gap. (Electrical world, New York, v. 67, 1916, p. 649–650.) † **VGA**

Investigations which show variations in spark-over voltage of a sphere gap setting, and tests to determine the effect of foreign matter on spheres.

244. Montsinger, V. M. Effect of barometric pressure on temperature rise of self-cooled stationary induction apparatus. (American Institute of Electrical Engineers, Transactions, New York, v. 35, 1916, p. 599–626; discussion, p. 627–633.) † **VGA**

Abstracted in *Science abstracts,* London, v. 19-B, 1916, p. 223–224, 436, *PAA.*

The subject matter of this paper is divided into three parts: (1) a general review of the principal laws of the dissipation of heat — radiation, conduction, and convection; (2) the development of a simple formula for the effect of altitude on the cooling of surfaces of different shapes; and (3) a general discussion of the method of conducting experimental observations at different altitudes, on three different shaped surfaces.

245. Niethammer, F. Hochspannungsapparate und Brandschutz. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 34, 1916, p. 65–67, 81–85.) † **VGA**

Discusses the conditions present in the breaking of heavy loads under oil, the heat and pressure generated at the contacts and considers the relation of contact material and construction, resistance and speed of break to wave distortion.

246. Peek, F. W., Jr. The effect of high continuous voltages on air, oil, and solid insulation. (American Institute of Electrical Engineers, Transactions, New York, v. 35, 1916, p. 783–800; discussion, p. 801–808.) † **VGA**

Same, condensed, in *Electrician,* London, v. 77, 1916, p. 734–737, † *VGA.*

The dielectric strength of air, oil and solid insulations was determined for direct-current voltages up to 150 kv. The direct-current sparkover in oil

1916, continued.

generally corresponds closely to the maximum alternating-current voltages. When the oil is wet the direct-current breakdown voltage is lower than the alternating-current breakdown voltage; the author ascribes this to the lining up of water particles under direct-current stress. Tables and curves give the breakdown voltages at various temperatures for numbers 6 and 8 oils.

247. **Peck,** E. P. Testing and filtering of transformer oil. (Electrical world, New York, v. 67, 1916, p. 1413–1414.) † **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 10, 1916, p. 2143, *PKA*.

Outlines the equipment and the methods used by the Georgia Railway and Power Company, to maintain the dielectric quality of insulating oil.

248. **Portable** 30,000-volt oil-testing outfit. (Electrical world, New York, v. 67, 1916, p. 280–281.) † **VGA**

American Transformer Company, type Ts-6.

249. **Radcliffe,** L. G., and C. Polychronis. The iodine absorption and tendency to sludge formation of some hydrocarbon oils. (Society of Chemical Industry, Journal, London, v. 35, 1916, p. 340–343.) **VOA**

Abstracted in *Chemical abstracts,* Easton, v. 10, 1916, p. 1708–1709, *PKA*.

Shows graphically and in tabulated form the relation between sludge formation and iodine value.

250. **Rockworth,** Kennedy G. Removing moisture from transil oil. (Electrical age. New York, v. 48, August, 1916, p. 40–42.) † **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 10, 1916, p. 2633, *PKA*.

Discusses effects of moisture on oil; curves show effects at 60 and 133 cycles. Rough tests for moisture, dehydration by filtering, heating and absorption methods. Advocates the filter press method as the quickest, safest and most convenient.

251. **Schroeder,** Hugo. Über Transformatorenöl. Eine Apparate zu seiner Reinigung und Trocknung. (Chemische Apparatur, Leipzig, Jahrg. 5, 1916, p. 205–206, 213–217.) † **VOA**

Abstracted in *Chemisches Zentralblatt,* Berlin, Folge 5, Jahrg. 21, 1917, Bd. 1, p. 544, *PKA*.

252. **Stern,** Georg. Nicht brennbares Schalteröl. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 37, 1916, p. 289.) † **VGA**

Abstracted in *Electrician,* London, v. 78, 1917, p. 690–691, † *VGA; Electrical world,* New York, v. 69, 1917, p. 664–665, †*VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 34, 1916, p. 432, † *VGA; Science abstracts,* London, v. 20, 1917, p. 139–140, *PAA*.

"The author describes experiments with pentachlorethane, which boils at 160° C., and has sp. gr. of 1.658 with a dielectric constant of 2.25. At ordinary temperatures it does not attack copper, iron or lead; if heated it generates chlorine and hydrochloric acid. When compared with ordinary switch oil, it was not found to suppress the arc as quickly, while the metallic parts were strongly attacked and the contacts much burnt. After a short circuit its insulation resistance falls immensely, and this is not the case with ordinary oil." No advantage is claimed for this liquid, alone or mixed with oil.

253. **Stern,** Georg, and Josef Biermanns. Ölschalterversuche. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 37, 1916, p. 617–620, 635–639.) † **VGA**

Same, condensed, in *Electrician,* London, v. 79, 1917. p. 884–886, † *VGA*. Abstracted in *Electrical world,* New York, v. 70, 1917, p. 724–725, † *VGA; Science abstracts,* London, v. 20-B, 1917, p. 103–104, *PAA*.

In addition to a study of the effect of variations in the mechanical design of breakers on rupturing capacity consideration is given to the effects of varying heads and pressures of oil.

254. **Vogelsang,** Max. Über den Ersatz des Öles durch Benzinoform bei Hochspannungsschalter. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 37, 1916, p. 153–155.) † **VGA**

Condensed in *Electrician,* London, v. 77, 1916, p. 540–541, † *VGA; Electrical world,* New York, v. 68, 1916, p. 533–534, † *VGA*. Abstracted in *Science abstracts,* London, v. 19-B, 1916, p. 219, *PAA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 34, 1916, p. 170, † *VGA*.

Comment by E. Mauthener in *Elektrotechnische Zeitschrift,* Jahrg. 37, 1916, p. 266; by Georg Stern, p. 289, † *VGA*.

Results of experiments with carbon tetrachloride as a substitute for oil. It has a high dielectric strength and is non-inflammable; its volatility may be overcome by covering with a layer of glycerine or water. At 45° C. copper is attacked by carbon tetrachloride; but aluminum, silver, lead and especially tin, show less effect. Metal parts should be tinned. Rubber, vulcanite, pertinax and micanite are all attacked; fibre and mica are not. It is not recommended that carbon tetrachloride be used in regulation equipment, due to a number of reasons; a mixture of 25% chloride and 75% oil is recommended as more suitable.

255. **Waters,** Campbell Easter. Data on the oxidation of automobile cylinder oils. Washington: Government Printing Office, 1916. 20 p. diagrs. 4°. (United States. — Bureau of Standards. Technologic paper no. 73.) **VBDA**

Effect of heating, sunlight and air, and the relation of iodine number, flash point, fire point, and evaporation on heating, to carbonization.

256. **Wyssling.** Tests on oil switches. (Electrician, London, v. 77, 1916, p. 8–9.) † **VGA**

Condensed form of second report of the commission on high-tension apparatus and fire protection of the Schweizerische elektrotechnische Verein und Verband schweizerische Elektrizitätswerke. Deals with the danger of fire resulting from the explosion of oil switch tanks or the throwing or spilling of oil; compares the relative values of water, sand, carbon dioxide and fluid extinguishing devices. Advocates the use of cellular construction with oil drains, and sectionalizing disconnects.

1917

257. **Appareils** auxiliaires pour transformateurs et machines électriques. Le filtre-presse. (Revue BBC, Baden, année 4, 1917, p. 131–137.) **VGA**

Discusses the effect of moisture on dielectric strength and describes the Brown-Boveri filter press and paper drying oven.

1917, continued.

258. **Coggleshall,** K. M. Extinguishing electric fires in power stations. (Electrical review, Chicago, v. 71, 1917, p. 517–518.) † VGA

Advocates the use of carbon tetrachloride.

259. **Elkin,** R. I. Eliminating danger from transil oil. (Electrical world, New York, v. 69, 1917, p. 283–284.) † VGA

Points out the fire risk involved in the use of oil; discusses the feasibility of using carbon tetrachloride as a substitute, but finds it unsatisfactory for a number of reasons. A medium solid below 40 degrees is suggested as it has been found satisfactory in transformers operating as high as 20,000-volts, 200-watts capacity.

260. **Filterpresse** zum reinigen und trocknen von Transformatoren- und Schalteröl. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 35, 1917, p. 510.) † VGA

Abstracted from the *Schweizerische elektrotechnische Verein, Bulletin,* v. 8, no. 8.

Discusses the effect of moisture and impurities on dielectric strength, and the feasibility of their removal by the use of the Brown-Boveri filter press.

261. **Fletcher,** F. S. To prevent oil syphoning over conductors from transformers. (Electrical review, Chicago, v. 71, 1917, p. 73.) † VGA

Describes the method of destroying capillarity by cutting back the insulation.

262. **Hirobe,** T., and others. Electrical insulating properties of transformer oil. (Electrician, London, v. 78, 1917, p. 656–657.) † VGA

Same, condensed, in *Electrical world,* New York, v. 68, 1916, p. 1301–1302, † *VGA*. Abstracted in *Chemical abstracts,* Easton, v. 11, 1917, p. 317, *PKA; Science abstracts,* London, v. 20, 1917, p. 101, *PAA*.

Abstract of report no. 25, Electrotechnical Laboratory, Tokyo. Tests were conducted to determine precisely the effects of various amounts of dust on the dielectric properties of oils. A curve gives the breakdown voltages of oil with from 0 to 60 percent mixture using sphere electrodes. It is concluded that moisture does not of itself have much effect on the dielectric strength of oil unless absorbing media is also present.

263. **Home-made** apparatus for use in testing oil. (Electrical world, New York, v. 69, 1917, p. 803.) † VGA

Adjustable vertical-gap in glass cylinder.

264. **Insulating** properties of transformer oil. (Electrical world, New York, v. 69, 1917, p. 66–67.) † VGA

An editorial covering in a general way the qualities desirable in an insulating oil and the causes of rupture.

265. **Kennelly,** A. E., and R. J. Wiseman. Apparent dielectric strength of varnished cambric. Its diminution with increase of electrode diameter associated with metallic structure of electrode and possibly due to high-frequency oscillations — necessity of standardizing size of test electrodes. (Electrical world, New York, v. 70, 1917, p. 1138–1141.) † VGA

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 40, 1919, p. 108, † *VGA; Science abstracts,* London, v. 21, 1918, p. 71, *PAA*.

When oil was used as the medium surrounding the electrodes and the test cambric the diminution in apparent dielectric strength with increase in area was always less than with air.

266. **Mackey,** W. Oxidation of oils in presence of soluble metallic catalysts. (Society of Chemical Industry, Journal, London, v. 36, 1917, p. 317–319.) VOA

Abstracted in *Chemical abstracts,* Easton, v. 11, 1917, p. 2049, *PKA*.

Record of tests conducted with olive oil and linseed oils. Metals used were cobalt, magnesium, nickel, cerium, lead, chromium, iron, sodium, bismuth, silver, zinc, mercury, aluminum, copper and tin.

267. **Martineau,** Albert. Hints about testing oil. (Electrical world, New York, v. 69, 1917, p. 1160–1161.) † VGA

Importance of determining minimum breakdown voltage and other considerations.

268. —— Peculiar trouble wrecks whole transformer bank. (Electrical world, New York, v. 69, 1917, p. 1210–1211.) † VGA

The siphoning of oil down a secondary lead resulted in overheating of one transformer and consequent fire which destroyed the entire bank. Recommends that periodic inspections be made, and that insulation be cut back in order to overcome capillarity.

269. **Montsinger,** V. M. Cooling of oil-immersed transformer windings after shutdown. (American Institute of Electrical Engineers, Transactions, New York, v. 36, 1917, p. 711–730; discussion, p. 731–734.) VGA

Abstracted in *Electrical review,* Chicago, v. 71, 1917, p. 34, † *VGA; Science abstracts,* London, v. 20-B, 1917, p. 245, *PAA*.

The author points out the discrepancy in measurement of temperature due to the lapse of time between the instant of shutdown and the time of observing the resistance measurements. Three methods of determining the temperature at shutdown are given as follows: take a cooling curve and exterpolate back to the instant of shutdown; use an arbitrary correction; calculate the rate of cooling.

270. —— Effect of barometric pressure on temperature rise of self-cooled transformers. (General Electric review, Schenectady, v. 20, 1917, p. 44–55.) VGA

Abstracted in *Electrical world,* New York, v. 69, 1917, p. 43–44, † *VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 39, 1918, p. 408, † *VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 31, 1919, p. 51, † *VGA; Science abstracts,* London, v. 20-B, 1917, p. 111, *PAA*.

Discusses the effect of altitude upon the temperature rise of oil-immersed transformers without water cooling and describes tests made at several altitudes. Formulæ are developed which will enable the effect of altitude to be accurately taken into account in the design of tanks of various shapes and sizes, and with and without irregular contours.

271. **Oil** testing cup. (Electrical world, New York, v. 69, 1917, p. 539.) † VGA

Abstracted in *Chemical abstracts,* Easton, v. 11, 1917, p. 1290, *PKA*.

Westinghouse vertical type in graduated glass cylinder.

1917, continued.

272. **Reid,** J. B. To keep transformer cables from siphoning oil. (Electrical review, Chicago, v. 70, 1917, p. 416.) † **VGA**

By cutting back insulation and the use of glycerine.

273. **Skinner,** C. E. Dielectric losses in insulating materials. (Franklin Institute, Journal, Philadelphia, v. 183, 1917, p. 667–714.) **VA**

Same in *Electric journal,* Pittsburgh, v. 14, 1917, p. 260–271, *VGA.*

Describes the set up of apparatus using an electrostatic voltmeter and wattmeter; its theory and method of use. Results of tests as obtained with this equipment are shown graphically covering power factor and dielectric losses for various solid dielectrics, dry and in oil at different frequencies.

274. **Sorensen,** R. W. Testing transformer oil by use of megger. (Electrical world, New York, v. 70, 1917, p. 564.) † **VGA**

Advantages of megger test over other methods in common use are cited. Data on effect of moisture and temperature on insulation are given in graphic form.

275. **Still,** Alfred. Insulation of high-voltage transformers. — Oil-filled bushings. (Electrical world, New York, v. 69, 1917, p. 312–315, 603–607.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 35, 1917, p. 355, † *VGA; Revue générale de l'électricité,* Paris, tome 2, 1917, p. 492–498, *VGA; Science abstracts,* London, v. 21-B, 1918, p. 32–33, *PAA.*

The first portion is a study of the potential gradient of solid insulations, alone and in series with oil. The second portion includes a consideration of bushing design, pointing out precautions to be taken against breakdown through corona, brush discharge, deterioration of oil, surface leakage and arc over. Data is given for the determination of insulation dimensions for different services.

276. **Vereinigung der Elektrizitätswerke.** Bedingungen für Transformatoren- und Schalteröle. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 35, 1917, p. 378.) † **VGA**

277. —— Rechtlinien für die Beschaffung von Transformatoren- und Schalterölen. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 38, 1917, p. 399.) † **VGA**

Abstract of Mitteilungen no. 93.

278. **Zanetti,** J. E., and G. Egloff. The thermal decomposition of benzene. (Industrial and engineering chemistry, Easton, v. 9, 1917, p. 350–356.) † **VOA**

Summarized in *Chemical abstracts,* Easton, v. 11, 1917, p. 1745, *PKA.*

Under various temperatures and in the presence of certain metals. Bibliography.

1918

279. **Arrangement** for cooling transformers in substations. (Electrical world, New York, v. 72, 1918, p. 1029.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 37, 1919, p. 131, † *VGA.*

Water from cooling tower forced through units in multiple and circulation checked by flow meters.

280. **Bauer,** Bruno. Tests on oil switches. (Electrician, London, v. 80, 1918, p. 764–767.) † **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 12, 1918, p. 881–882, *PKA; Science abstracts,* London, v. 20-B, 1917, p. 441–442, *PAA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 40, 1919, p. 481–482, † *VGA.*

Condensed form of fourth report of the commission on high-tension apparatus and fire protection of the Schweizerische elektrotechnische Verein und Verband schweizerische Elektricitätswerke. Deals with the thermodynamic and chemical processes associated with the operation of switching off a load, particularly with a view to studying pressure and explosive effects with d-c. A device consisting of carbon plates is used for determining pressure generated within the tank, the resistance of which is varied with the pressure applied, the pressure being recorded by oscillographic record of a constant source of potential flowing through the device, and varied by the change of resistance.

The operation of the switch causes local burning of the contacts, production of turbidity in the oil, evolution of gas and generation of pressure in the oil. An analysis of the gases formed, the volume of which is directly proportional to the switch energy, indicated hydrogen, heavy hydrocarbons, small volumes of methane, nitrogen and oxygen, and free carbon. The gas sphere is driven upwards and may cause a complete space between the arc and the air, or gas, over the oil resulting in explosion.

The reliability of oil-switches may be increased by shortening the duration of the arc, thus the switch energy; by introducing artificial circulation of the oil; by enclosing the arcing space in an explosion chamber; by replacing air with an inert gas; by increasing the strength of the tanks; by cooling the gases by passing them through wire gauze. These methods are considered in detail. The use of chlorine derivatives is considered but is condemned because of their corrosive action on the metal parts, and increased formation of carbon.

281. **Buelteman.** Isoliermaterialien der Elektrotechnik. (Gummi-Zeitung, Berlin, Jahrg. 32, 1918, p. 621–622, 648–649, 663–664, 679–682, 691–692.) † **VMA**

Same in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 35, 1917, p. 575–581, 588–592, † *VGA.* Condensed in *Electrician,* London, v. 82, 1919, p. 491–493, 543–544, † *VGA.* Abstracted in *Science abstracts,* London, v. 21-B, 1918, p. 99–100, *PAA; Chemical abstracts,* Easton, v. 12, 1918, p. 1730, *PKA.*

Paper read before the Elektrotechnische Verein, Dresden. An examination of the physical and chemical properties of various natural and synthetic insulating materials; the last portion dealing with oils, their characteristics and requirements for service in transformers and switches.

282. **Butman,** Chester Arthur. The characteristics of dielectrics. (Electrical world, New York, v. 71, 1918, p. 812–815.) † **VGA**

Abstracted in *Science abstracts,* Easton, v. 21, 1918, p. 219–220, *PAA; Electrical world,* New York, v. 71, 1918, p. 812, † *VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 40, 1919, p. 270, comment by L. Pungs, p. 529, † *VGA.*

Results of investigations to determine the dielectric constants, strengths, loss angles and energy losses of micarta, fullerboard, paraffine oil and other substances, singly and in combination. Dielectric strength of paraffine oil was tested over a wide range of temperature. A transition point was noted at the melting point (-12° C.); the dielectric strength then begins to increase; there is a second transition point at 50° C., the dielectric strength remaining constant to 100° C., after which it again falls rapidly. The dielectric constant of a heterogeneous combination was found to be greater than either component alone. The author believes that all dielectric properties of paraffine oil can be explained on the basis of polarization and ionization, and gives reasons for his views.

1918, continued.

283. —— Flexible and accurate method for dielectric tests. (Electrical world, New York, v. 71, 1918, p. 502–506.) † **VGA**

Abstracted in *Science abstracts,* London, v. 21-B, 1918, p. 188, *PAA.*

Description of a series-inductance bridge for measuring dielectric energy losses at low frequencies and high potential gradients; especially valuable in investigating anomalous dielectrics. The change of the dielectric to the state of a conductor can be traced by changing the temperature. Alternating current is used, thus obviating the dielectric after-effect caused by the use of direct-current. Determination may be obtained of the geometric capacity of condensers having a capacity of from 1 mfd. to 0.0001 mfd. with one setting of the bridge arms, with an accuracy of about 0.01 per cent of the capacity measured. For high potentials samples are immersed in oil, thus lowering the point where corona would occur.

284. Erickson, S. F. Some phases of protecting distributing transformers. — Oil as a factor affecting performance. (Electrical review, Chicago, v. 72, 1918, p. 189.) † **VGA**

Lays particular emphasis upon the danger of siphoning of oil, and the effect of oil on rubber insulation.

285. Flight, William Stanley. Transformer oil. (Electrician, London, v. 81, 1918, p. 636–638, 664–667, 686–689.) † **VGA**

Abstracted in *Electrical world,* New York, v. 73, 1919, p. 135, † *VGA.*

Oils may be roughly divided into fixed oils and straight oils. The former give trouble through the formation of sludge; the latter are more free from this defect. For use in transformers it is necessary to take into account viscosity, specific gravity, dielectric strength and other properties. Examples are given of the variation of specific gravity and viscosity, and the methods of determining the latter are given. The carrying out of dielectric strength tests is described, and the effect of dirt, air and circulation of the oil is considered on the results obtained. The formation of sludge and methods of preventing it are discussed. Tests are described for iodine value, acidity, evaporation, sulphur, etc.

286. Fraser, M. A. Condition of oil affects performance. (Electrical review, Chicago, v. 73, 1918, p. 64.) † **VGA**

Points out the danger of heating of oil-insulated induction apparatus due to the sludging of oil.

287. Fuchs, F. C. Modification of benzol method for water determination in mineral oils. (Engineering and mining journal, New York, v. 106, 1918, p. 357.) † **VHA**

Small amounts of water were found to be held in suspension; this difficulty was obviated by the addition of a coloring substance soluble in benzol but insoluble in water; thus the colorless portions of water were easily visible, and by tapping the burette were made to sink to the bottom.

288. General Electric Company. Oil testing outfits. Schenectady, N. Y., 1918. 8°. (General Electric instruction book 85298.) **VGF**

Construction and method of use.

289. —— Transformer oil dryer and filter. Schenectady, N. Y., 1918. 8°. (General Electric instruction book 85299.) **VGF**

290. Lichtenberg, Chester. Rating and selection of oil circuit-breakers. Discussion. (American Institute of Electrical Engineers, Transactions, New York, v. 37, 1918, p. 157–159.) † **VGA**

Describes with illustrations the nature and character of arcs formed under oil and the effects on oils and switching equipment.

291. Marcusson, J. Der Seifengehalt raffinierter Mineralöle. (Mitteilungen aus dem Königlichen Materialprüfungsamt zu Berlin Lichterfelde West, Berlin, Jahrg. 36, 1918, p. 279–280.) **VA (Prussia)**

Reviews methods of determination.

292. Miller, Francis. Oil leakage causes transformer failure. (Electrical review, Chicago, v. 72, 1918, p. 431.) † **VGA**

By siphoning through the secondary leads.

293. Montgomery, M. S. An emergency method of treating transil oil. (Electrical review, Chicago, v. 72, 1918, p. 386.) † **VGA**

Filter bed of calcium chloride removes moisture cheaply and quickly where oil filter is unobtainable.

294. Motor driven pump for handling oil. (Electrical review, Chicago, v. 72, 1918, p. 1056.) † **VGA**

295. Oil-absorbing bed for oil-filled apparatus. (Electrical review, Chicago, v. 72, 1918, p. 524.) † **VGA**

Consists of a shallow concrete well built into the foundation and filled with sand.

296. Perlewitz, Kurt. Selbsttätige Feuerlöschvorrichtung für Transformatoren- und Ölschalterräume. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 39, 1918, p. 209–210.) † **VGA**

Abstracted in *Electrical world,* New York, v. 72, 1918, p. 71, † *VGA; Electrician,* London, v. 81, 1918, p. 57, † *VGA.*

Carbon dioxide is liberated by the proximity of excessive temperature to a fusible plug.

297. Radcliffe, L. G. Some physical and chemical properties of hydrocarbon oils used as insulating media. (Society of Chemical Industry, Journal, London, v. 37, 1918, p. 109R.) **VOA**

Abstract of paper read before the Manchester local section. Deals chiefly with the changes caused by oxidation, and the effects of oxidation products upon metals.

298. Reed, Emerson G. The essentials of transformer practice. — Properties of insulating oil. (Electric journal, Pittsburgh, v. 15, 1918, p. 136.) **VGA**

299. Salient features of high-voltage oil-immersed strain insulator. (Electrical review, Chicago, v. 72, 1918, p. 281–282.) **VGA**

Details of insulator designed for 120-kv. and 35,000 pound loading; comprises expansion chamber, oil insulation and wood strain blocks.

300. Schendell, G. Die Untersuchung der Schalter- und Transformatorenöle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 39, 1918, p. 242–245.) † **VGA**

Condensed in *Electrician,* London, v. 82, 1919, p. 125, † *VGA.* Abstracted in *Chemical abstracts,* Eas-

1918, continued.

ton, v. 13, 1919, p. 934, *PKA; Science abstracts,* London, v. 21-B, 1918, p. 405–406, *PAA; Electrical world,* New York, v. 73, 1919, p. 489, † *VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 36, 1918, p. 494, † *VGA.*

Either resinous or mineral oils may be used in transformers; in switches mineral oils alone are suitable; a distinction is made in the qualities necessary in these two classes of oils for their respective uses. Considers formation of deposits, catalytic action on copper and cotton, acidity and alkalinity, free sulphur, resin and asphalt; tests for their presence and their effects upon the oil.

301. **Shepherd,** Claude H. Increasing transformer capacity by circulating oil. (Electrical world, New York, v. 71, 1918, p. 560–562.) † **VGA**

Installation of oil-circulating system at cost of $700 increased permissable load on 200-kva. and 450-kva. transformer banks 60%.

302. **Stephens,** H. O., and A. Palme. Radiator tank transformers. (General Electric review, Schenectady, v. 21, 1918, p. 556–559.) **VGA**

This article describes some of the latest forms of oil-cooled transformer shells and radiators.

303. **Torche,** P. Les interrupteurs à huile et la protection contre l'incendie. (Revue générale de l'électricité, Paris, tome 4, 1918, p. 311–320, 343–348.) **VGA**

Abstracted in *Electrical world,* New York, v. 72, 1918, p. 704, † *VGA.*

Discusses the conclusions reached by the Schweizerische elektrotechnische Verein on the problem of minimizing the fire hazard in electrical equipment and stations. The action of the oil switch in breaking heavy loads is studied with a view to determining the causes of stresses, fires and explosions. For original reports see entries under Bauer and Wyssling.

304. **Transformer** inspection as economic measure. (Electrical world, New York, v. 71, 1918, p. 875–878.) † **VGA**

Chances of failure are reduced if transformers are maintained clean and dry and with leads and bushings intact. Practical methods are given of cleaning transformer windings, tanks and bushings and of purifying oil; describes a bushing construction that prevents siphoning.

305. **Wagner,** H. E. Forced cooling increases capacity. (Electrical review, Chicago, v. 72, 1918, p. 283.) † **VGA**

Describes a method of installing an auxiliary oil supply for transformers.

306. **Weber,** H. C. P., and T. C. MacKay. Change of specific inductive capacity with temperature and impregnation in paper. (Franklin Institute, Journal, Philadelphia, v. 186, 1918, p. 374–377.) **VA**

Study of paraffine and ceresin alone and impregnated into paper.

1919

307. **Alsaker,** Alfred. Outdoor substation practice and use of carbon tetrachloride fuses. (Association of Iron and Steel Electrical Engineers, Proceedings, St. Louis, 1919, p. 55–68; discussion, p. 68–83.) **VGA**

308. **Battle,** John Rome. Careful inspection necessary of oil in transformers. (National petroleum news, Cleveland, v. 11, Dec. 10, 1919, p. 43–44, 46.) **VHYA**

Discusses the various factors which contribute to the breakdown of the dielectric strength of oils, routine of inspection, and methods of purification.

309. —— Points to be considered regarding transformer oils. (National petroleum news, Cleveland, v. 11, Dec. 10, 1919, p. 41–42, 44.) **VHYA**

Covers in a general way the requirements of transformer oils, in respect to heat transfer, dielectric strength, flash point and neutrality.

310. **Bouzon,** Raymond. Étude des diélectriques industriels. (Revue générale de l'électricité, Paris, tome 6, 1919, p. 137–148, 181–189.) **VGA**

Abstracted in *Science abstracts,* London, v. 22-B, 1919, p. 382, *PAA.*

Methods and apparatus for determining the dielectric loss under alternating-current and direct-current of plain and oiled solids.

311. **Charpentier,** P. Les phénomènes d'interruptions dans l'huile et les possibilités de réglementation des appareils. (Revue générale de l'électricité, Paris, tome 6, 1919, p. 404–414.) **VGA**

Abstracted in *Electrical world,* New York, v. 74, 1919, p. 1023–1024, 1172, † *VGA; Science abstracts,* London, v. 23-B, 1920, p. 32, *PAA.*

Discusses the conditions governing the formation and interruption of alternating-current arcs under oil; considers the heating effects of the arc, formation of gas, speed of break and the use of multiple breaks.

312. **Compact** oil-testing cup. (Electrical world, New York, v. 73, 1919, p. 348.) † **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 13, 1919, p. 934, *PKA.*

Westinghouse horizontal-break type.

313. **Dann,** Walter M. Transformer oil. (American Institute of Electrical Engineers, Transactions, New York, v. 38, 1919, p. 1103–1107.) † **VGA**

Discusses the function of oil and methods of purification in service.

314. The **Electrically-heated** Simplex oil filter. (Electrical review, Chicago, v. 75, 1919, p. 213.) † **VGA**

315. **Eschholz,** O. H. Some characteristics of transformer oils. (Electric journal, Pittsburgh, v. 16, 1919, p. 74–76.) **VGA**

Abstracted in *Electrical world,* New York, v. 73, 1919, p. 487, † *VGA.*

The author discusses the causes and nature of explosions, the pressures resulting, and the gases formed, in transformers due to the overheating of the oil, stating that slight differences in flash or fire points of oils do not materially affect the likelihood of explosion, but owing to the lower vapor pressure and consequent decreased dilution of hydrogen by the hydrocarbon vapors, explosions in the higher flash oils are occasionally more violent.

1919, continued.

316. **Etwas** über Transformatoren und Schalteröle. (Der Papier-Fabrikant, Berlin, Jahrg. 17, 1919, p. 470–472.) † **VMPA**

Abstracted in *Chemisches Zentralblatt*, Berlin, Folge 5, Jahrg. 1, Bd. 4, 1919, p. 161–162.

Brief summary of tests for chemical and physical properties, and specifications of the Vereinigung der Elektrizitätswerke.

317. **General Electric Company.** Large oil-immersed transformers. — Oil. Schenectady, N. Y., 1919. illus. 8°. (General Electric instruction book 85210.) **VGF**

p. 23–26: Sampling, testing and drying of oil; describes testing transformer and gap; p. 26: Curve showing comparison of breakdown value between the old and new standard oil-testing gaps (0.5 in. flat disks 0.2 in. apart and 1.0 in. flat disks 0.1 in. apart); p. 28: Purifying oil without interrupting service; p. 38–39: Breathers.

318. **Gill,** Augustus Herman. A short hand-book of oil analysis. Philadelphia: J. B. Lippincott Company [1919]. 215 p. illus. 8°. **VHY**

p. 169–170: General requirements of transformer oil.

319. **Hilton,** J. R. Combating the breathing effect of large outdoor transformers. (Electrical review, Chicago, v. 74, 1919, p. 432.) † **VGA**

Discusses several methods devised to prevent the entrance of moisture due to the breathing caused by variations in temperature of the oil.

320. **Jackson,** R. P. Electrical insulating materials. (Electric journal, Pittsburgh, v. 16, 1919, p. 326–333.) **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 13, 1919, p. 2162, *PKA.*

A general survey of the application of various classes of solid, liquid and semi-liquid insulations to different types of machines. Discusses the importance of flash point, sludging character, viscosity, specific inductive capacity, and specific heat when used in transformers and switches.

321. **Krammer,** Anton. Zur Bestimmung der Verteerungszahl von Mineralölen. (Petroleum, Berlin, Jahrg. 14, 1919, p. 1025–1026.) **VHYA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 1920, p. 834–835, *PKA.*

Describes a method of removing tar sludge by the use of benzene. Tabulated form gives comparative results of this method as compared with that of Holde and that of Schwarz and Marcusson.

322. **Loiseaux,** A. S. Oil switches. (National Electric Light Association, Proceedings, Technical and Hydroelectric Section, New York, 1919, p. 420–421.) **VGS**

Discusses the formation of oil gas in switch tanks, and the explosion resulting therefrom.

323. **Montsinger,** V. M. Cooling of transformer windings after shutdown. (General Electric review, Schenectady, v. 22, 1919, p. 1056–1065.) **VGA**

Abstracted in *Electrical world,* New York, v. 75, 1920, p. 559, † *VGA; Science abstracts,* London, v. 23-B, 1920, p. 149–151, *PAA.*

Considers the advantages and disadvantages of various methods of determining the temperature corrections for the cooling of windings of self- and water-cooled transformers.

324. **Moody,** Walter S. A new form of tank for static transformers. (General Electric review, Schenectady, v. 22, 1919, p. 756–759.) **VGA**

Abstracted in *Science abstracts,* London, v. 23-B, 1920, p. 44, *PAA.*

Describes the operation and construction of the conservator tank, and discusses its value as a means of reducing the liability of transformers to explosion, the entrance of moisture, and particularly the oxidation and sludging of oil; this last is attained by isolating the air from the heated portions of the oil. A colored plate shows the discoloration and formation of deposit present in samples of an oil after contact with air at various temperatures.

325. **Mueller,** J. Isolierprobleme an Transformatoren für hohe Spannungen. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 37, 1919, p. 413–416.) † **VGA**

Abstracted in *Science abstracts,* London, v. 23-B, 1920, p. 40–41, *PAA.*

After a general discussion of the dielectric properties of various transformer insulating materials the author gives methods for calculating the dielectric strengths of various arrangements of sheet insulation separated by oil-channels. The importance of taking into consideration the critical stresses and dielectric constants of materials when dealing with series insulation is stressed.

326. **Oil** fumes menace to oil circuit-breakers. (Electrical review, Chicago, v. 75, 1919, p. 73–74.) † **VGA**

Recommends the preclusion of this danger by efficient ventilation.

327. **Pagliani,** Stefano. Sugli olii per trasformatori. (L'Elettrotecnica, Milano, v. 6, 1919, p. 510–511.) **3–VGA**

Compares the viscosities of a number of samples of American, Russian, Italian and English transformer oils with a view to determining viscosities at different temperatures.

328. **Philip,** Arnold. Testing transformer oil. (Electrician, London, v. 82, 1919, p. 103.) † **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 13, 1919, p. 539, *PKA; Electrical world,* New York, v. 73, 1919, p. 437, † *VGA; Society of Chemical Industry, Journal, Review,* London, v. 38, 1919, p. 23 R, *VOA; Electrical review,* London, v. 84, 1919, p. 175, † *VGA; Science abstracts,* London, v. 22–B, 1919, p. 93, *PAA.*

Tests conducted to determine effect of moisture, and methods of removal. Minute quantities of water may be determined by a condensation method described.

329. **Reed,** Emerson G. Essentials of transformer practice — XIX. Operating conditions. (Electric journal, Pittsburgh, v. 16, 1919, p. 66–68.) **VGA**

Methods of drying transformer tanks and cores, sampling, shipping, transferring, and filtering oil.

330. **Schwaiger,** Anton. Lehrbuch der elektrischen Festigkeit der Isoliermaterialien. Berlin: Julius Springer, 1919. vi, 143 p. illus. 8°. **VGM**

p. 102: Liquid dielectrics; p. 103: Specifications of the V. D. E.; p. 142: Dielectric constants of oils; p. 143: Table of dielectric strengths of transformer oil and various solids.

1919, continued.

331. **Shrader,** J. E. Conduction in liquid dielectrics. (Electric journal, Pittsburgh, v. 16, 1919, p. 334–338.) **VGA**

Abstracted in *Chemical abstracts,* Easton, v. 13, 1919, p. 2160, *PKA.*

The author studies the process of the resistance a liquid dielectric offers to the passage of current. There is at first a flow of electricity which is large compared to the value of the current when it has reached a steady state; the method of separating these components and a study of their respective natures forms the substance of this paper. A part of the initial current is due to instantaneous condensive charge and a part to absorption and to conduction. The current due to absorption decays almost exponentially with time. The value of the current after it has reached a steady state is due to the ordinary conduction. Oils used as samples were: lactroseal, high flash transformer oil, xylene, castor oil, and benzene.

332. **Still,** Alfred. Principles of transformer design. New York: John Wiley & Sons, Inc., 1919. xii, 216 p. illus. 8°. **VGI**

p. 52–54: Oil, insulation, dielectric strength alone and in series with other insulations; p. 57–62: Oil-filled bushings.

333. **System** of filtering dirty transformer oil. (Electrical world, New York, v. 74, 1919, p. 760.) **† VGA**

Closed circuit arrangement of tanks and filter press for filtering large quantities of insulating oil at high temperature.

334. **Taylor,** T. S. The thermal conductivity of insulating and other materials. (Electric journal, Pittsburgh, v. 16, 1919, p. 526–532.) **VGA**

Abstracted in *Science abstracts,* London, v. 23-B, 1920, p. 186–188, *PAA.*

Tabulated results of tests with solid insulations, dry and oil impregnated.

335. **Urbain,** Ed., and Clair Scal. Sur la décomposition de liquides diélectriques au sein desquels jaillit un arc. (Académie des sciences, Comptes rendus, Paris, tome 168, 1919, p. 887–889.) **OA**

Abstracted in *Science abstracts,* London, v. 22-A, 1919, p. 390, *PAA.*

Saturated hydrocarbons yield acetylene, ethylene, hydrogen and free carbon; ketones yield carbon monoxide and various hydrocarbons, tetrachlorides of carbon; tin and titanium yield chlorine. The rupture of the arc itself liberates little gas, but a sustained arc yields an abundant supply.

336. **Vogelsang,** Max. Über Hochleistungsschalter. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 40, 1919, p. 597–600.) **† VGA**

Abstracted in *Electrical world,* New York, v. 75, 1920, p. 1014, *† VGA; Science abstracts,* London, v. 23-B, 1920, p. 247–248, *PAA.*

There are two types of oil-switch explosions, in one of which the switch tank explodes with great violence, in the other type relatively little damage results. Violent explosion is attributed to low oil-level, inferior oil, or to the use of a metal fuse which melts at a temperature above the flash-point of the oil, and producing considerable oil vapor. Explosion may result from the heating of the tank due to sustained arcing between live parts and the tank. Benzinoform has been tried as a substitute for oil, but has been found unsatisfactory due to its volatility and its corrosive action.

337. **Waters,** Campbell Easter. Sulphur in petroleum oils. Washington: Government Printing Office, 1920. 26 p. diagrs., tables. 4°. (United States. — Bureau of Standards. Technologic paper no. 177.) **VBDA**

Various methods for the determination of sulphur in oil are described and the significance of its presence discussed. Bibliographical footnotes.

1920

338. **Additional** oil ducts to reduce temperature of transformers. (Electrical review, Chicago, v. 76, 1920, p. 665.) **† VGA**

Changes made in transformers to cure overheating under normal operation.

339. **American Society for Testing Materials.** Standard method of test for loss on heating of oil and asphaltic compounds. Serial designation D6–20. (American Society for Testing Materials, Standards, Philadelphia, 1920, p. 732–734.) **VEE**

340. **Atkins,** W. R. G. The stability requirements of transformer and insulating oils. (Beama, London, v. 6, 1920, p. 421–425.) **VGA**

Discusses the requirements of an insulating oil, giving the characteristics in tabulated form. Short bibliography appended.

341. **Basler,** C. D. How to make moisture tests and evaporation tests on oil. (Electrical world, New York, v. 76, 1920, p. 288–289.) **† VGA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 1920, p. 2854, *PKA.*

Describes the copper sulphate method for detecting the presence of moisture, and the benzol test for quantitative determination.

342. **Battle,** John Rome. The handbook of industrial oil engineering. Philadelphia: J. B. Lippincott Company, 1920. viii, 1131 p. illus. 8°. **VON**

p. 1000: "Specifications for transformer oils"; p. 1001: Insulating properties and effect of impurities; p. 1002–1004: Testing; p. 1005: U. S. Army, Bureau of Aircraft Production; general specifications for transformer oil; p. 1007: Drying and filtering of oil; p. 1009: Fires in transformers and oil switches.

343. **Borden,** Douglas. Oil and glove testing on large distribution system. (Electrical world, New York, v. 75, 1920, p. 607–608.) **† VGA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 1920, p. 1265, *PKA.*

Describes set developed by Ontario Hydro-electric Power Commission.

344. **Carbon** tetrachloride replaces oil in circuit-breakers. (Electrical review, Chicago, v. 76, 1920, p. 583.) **† VGA**

Briefly discusses the feasibility of replacing oil with carbon tetrachloride, comparing their characteristics.

345. **Dean,** E. W., and D. D. Stark. A convenient method for the determination of water in petroleum and other organic

920, continued.

emulsions. (Journal of Industrial and engineering chemistry, Easton, v. 12, 1920, p. 486–490.) **† VOA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 920, p. 2145, *PKA.*

Distillation in the presence of an immiscible solvent. Bibliography given.

346. Duckham, Alexander, and Co. The testing of transformer oils. (Electrician, London, v. 84, 1920, p. 66.) **† VGA**

Outlines a few brief tests and operations intended o keep transformer oil in condition.

347. Failure averted by inspecting interior of oil-switch tanks. (Electrical world, New York, v. 75, 1920, p. 494.) **† VGA**

Warping of tank lining.

348. Flight, William Stanley. Spark-over voltages through air. — Oil vapour. (Beama, London, v. 7, 1920, p. 467–468.) **VGA**

49. Friese, Robert M. Über Durchchlagsfestigkeit von Isolierölen. (Wissenchaftliche Veröffentlichungen aus dem Siemens-Konzern. Bd. 1, 1920–22, p. 41–45.) **OAI (Harries)**

Same, condensed, in *Elektrotechnik und Maschinenau,* Wien, Jahrg. 40, 1922, p. 58–59, † *VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 43, 1922, p. 4, † *VGA.* Abstracted in *Chemisches Zentralblatt,* Leipzig, Jahrg. 92, Folge 6, Bd. 4, Teil 2, 1921, p. 349, *PKA; Science abstracts,* London, v. 25-B, 1922, . 152–153, *PAA; Chemical abstracts,* Easton, v. 16, 922, p. 2943, *PKA; Society of Chemical Industry, ournal,* London, v. 41, 1922, p. 147A, *VOA.*

A study of the effects of moisture and other impurities, temperature and pressure. Analytical methods were not found to give accurate measurements f small amounts of moisture. With the value for the insulation $D=1\cdot1/W+207$, where D represents kv. er cm., and W the moisture content in parts per 1,000; 0.3 parts per 1,000 causes the value of D to nk to 20 and remain at this level for any further ddition of water; whereas the first three-thousandths ause a drop of over 200 kv. per cm. in this value. his indicates that the mere presence of the moisture rom the atmosphere seriously lowers the dielectric alue.

50. Garrard, Charles Cornfield. Electric witch and controlling gear. A handbook n the design, manufacture and use of witchgear and switchboards in central staons, factories and mines. London: Benn rothers, Limited, 1920. xx, 654 p. 2. ed. lus. 8°. **VGM**

p. 13–23: "Oil for electrical purposes. Influence moisture. Drying oil. Presence of sulphur in oil. nsulation resistance of oil. Dielectric strength of l. Flash point. Specific gravity. Viscosity. Freeom from acid and alkali. Routine testing of insulang oil. Standard specifications for transformer oil. tandard specifications for switch oil. Life of transrmer oil and formation of sludge."

51. Gruen, Ad., and others. Die Oxydaon von Paraffin. (Deutsche chemische Geellschaft, Berichte, Jahrg. 53, 1920, p. 987–96.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 920, p. 3416–3418, *PKA.*

Investigation of the effect produced upon the oxiation by treating the oils with charcoal, charcoal npregnated with $FeSO_4$, "Tonsil", $Ca(OH)_2$, $a(OH)_2$, Ce_2O_3, $AlCl_3$, and stearic acid. Bibliographal footnotes.

352. Hejda, C. J. Increasing oil circuit-breaker capacities. (Electrical world, New York, v. 76, 1920, p. 67–68.) **† VGA**

A standard oil circuit-breaker, equipped with pressure vents, hollow contact rods and an improved liquid for quenching the arc, showed greatly increased rupturing capacity under actual tests.

353. Herschel, Winslow Hobart. Saybolt viscosity of blends. Washington: Government Printing Office, 1920. 21 p. diagrs., tables. 4°. (United States. — Bureau of Standards. Technologic paper no. 164.) **VBDA**

354. Kelber, C. Die Oxydation von Kohlenwasserstoffen mit Sauerstoff. Die Oxydation von Paraffin. (Deutsche chemische Gesellschaft, Berichte, Berlin, Jahrg. 53, 1920, p. 66–71.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 14, 1920, p. 2343, *PKA.*

355. Kreyssig. Kühlung von Transformatoren durch Gebläseluft. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 38, 1920, p. 449.) **† VGA**

Oil-filled transformers.

356. Leboucher, Paul. L'usine hydroélectrique d'Eget et ses installations à 120,000 v. (Revue générale de l'électricité, Paris, tome 8, 1920, p. 85–86.) **† VGA**

Describes the oil testing and purifying equipment provided in this station.

357. Lockhart, Luther Bynum. American lubricants from the standpoint of the consumer. Easton, Pa.: The Chemical Publishing Company, 1920. xi, 341 p. 2. ed. illus. 8°. **VON**

p. 57–58: "Transformer oil." Physical and chemical requirements; p. 235–236: "Gun oil. — (War Dept. Specif. no. 3,507-A, March 15, 1918. Approved and adopted by Ordnance Dept. and Signal Corps, U.S.A., and by the U. S. Navy);" p. 238–239: "Specifications for transformer oil, petroleum residues and miscellaneous oils. Transformer oil. — (War Dept. Specif. no. 3518, July 22, 1918 [tentative]. Quartermaster Corps, U.S.A.)." Covers physical properties and tests.

358. Matthis, Alfred R., and C. L. Belinne. Les huiles pour transformateurs et interrupteurs. Paris: Dunod [191–?]. 152 p. illus. 8°. **VGF p.v.26, no.3**

359. Oil testing transformer set. (Electrical review, Chicago, v. 76, 1920, p. 840.) **† VGA**

General Electric type.

360. Portable oil tester. (Electrical world, New York, v. 75, 1920, p. 816.) **† VGA**

General Electric type; tapped for various secondary voltages with a maximum of 25,000.

361. Schrottke, F. Über Hochleistungsschalter. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 40, 1919, p. 625–630; discussion, p. 655–659, and Jahrg. 41, 1920, p. 117–118.) **† VGA**

Tests were conducted on a standard German breaker to determine the efficiency of different features of construction. The practicability of minimizing the danger of explosion by changes in design is considered.

1920, continued.

362. Skinner, C. E. The story of the insulations. (Electric journal, Pittsburgh, v. 17, 1920, p. 139–145.) **VGA**

An historical record of the development of various insulations and of their applications. The use of insulating oil is traced from the use of "Diamond paraffine" in 1891 to date; the use of carbon tetrachloride as a possible substitute is considered.

363. A **Substitute** for transformer oil. (Electrical review, Chicago, v. 77, 1920, p. 889–890.) **† VGA**

An editorial, pointing out the need for a new insulating medium; compares briefly the characteristics of several substitutes, including carbon tetrachloride, which have already been tried.

364. Thomsen, T. C. The practice of lubrication. An engineering treatise on the origin, nature and testing of lubricants, their selection, application and use. New York: McGraw-Hill Book Company, Inc., 1920. xi, 607 p. illus. 8°. **VON**

p. 576–599: "Static electrical transformers and oil filled switches." p. 584: Specific resistance and dielectric strength; p. 586–589: Oxidation and sludging; p. 589–590: Expansion, expansion chambers; p. 590–592: "Thermal transference;" p. 593–594: "Treating transformer oils;" p. 594–596: "Filter presses;" p. 596–597: "Transformer explosions;" p. 597–598: "Oil switches;" p. 598–599: "Specifications for transformer and switch oils."

365. Union des syndicats de l'électricité. Cahier des charges pour la fourniture des huiles de transformateurs. (Revue générale de l'électricité, Paris, tome 7, 1920, p. 727–733.) **† VGA**

Abstracted in *Science abstracts,* London, v. 23-B, 1920, p. 375–376, *PAA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 42, 1921, p. 982, † *VGA.*

Two grades of oil are recognized, for which specifications and methods of testing are given. Tests cover sludge tendency, flash point of oil and vapour, viscosities, evaporation, density, freezing point, presence of acid, alkali and sulphur compound, moisture content and dielectric strength. Apparatus to be used described in detail.

366. United States. — Bureau of Standards. Carbonization of lubricating oils. November 12, 1920. Washington: Government Printing Office, 1920. 44 p. 4°. (United States. — Bureau of Standards. Circular no. 99.) **VBDA**

Brief account of the nature of petroleum oils and of the nature and effects of carbon formations in the oils used for lubricating internal combustion engines. Carbonization tests are described.

367. Die **Vorschriften** für Transformatorenöl in der Tscheckoslowakei. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 39, 1921, p. 334.) **† VGA**

Abstracted from *Elektrotechnickkij obzor,* Jahrg. 10, Heft 16, 1921.

1921

368. American Society for Testing Materials. Tentative method of test for cloud and pour points of petroleum products. Serial designation D 97–21 T. (American Society for Testing Materials, Proceedings, Philadelphia, v. 21, 1921, p. 674–678.) **VEE**

Same, condensed, in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 45, 1924, p. 1415–1416, † *VGA.*

369. —— Tentative method of test for water in petroleum products. Serial designation D 95–21 T. (American Society for Testing Materials, Proceedings, Philadelphia, v. 21, 1921, p. 666–669.) **VEE**

370. Appareils pour le séchage de transformateurs à bain d'huile. (Revue BBC, Baden, année 8, 1921, p. 94–99.) **VGA**

Method of drying oil by pumping through an electrically-heated drying outfit; pump and heating unit are described in detail.

371. Bouchet, L. Variation avec le temps des pressions crées, au sein de fluides isolants, par un champ électrostatique constant. (Académie des sciences, Comptes rendus, Paris, tome 173, 1921, p. 914–916.) **OA**

Abstracted in *Science abstracts,* London, v. 25-A, 1922, p. 141, *PAA.*

Results of investigations with xylene, hexane, vaseline oil, benzene, limonene and terebinth.

372. Bridge, A. J. Installation and operation of Metropolitan-Vickers power transformers. (Metropolitan-Vickers gazette, Manchester, v. 6, 1921, p. 100–106, 136–138.) **VGA**

The first portion of this article deals with the construction and installation of transformers and drying equipment; the second discusses the application and use of filter-presses and filter-paper drying ovens to oil maintenance.

373. Calcul des cuves lisses à huile, pour transformateurs et régulateurs d'induction. (Revue BBC, Baden, année 8, 1921, p. 14–23.) **VGA**

373A. Charpentier, P. Un coupe-circuit à huile inexplosible. (Revue générale de l'électricité, Paris, tome 9, 1921, p. 7–9.)

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 134–135, *PAA.*

An oil-immersed fuse in which melting of the fusible portion causes a stream of oil to be directed into the arc.

374. Coates, William Anselm. High voltage bushing insulators. (Metropolitan-Vickers gazette, Manchester, v. 6, 1921, p. 200–205.) **VGA**

Discusses in a general way the problems met with in the design of high-voltage solid and condenser type bushings, and points out the advantages gained by the use of oil-filled bushings.

375. Del Mar, William A. The maximum safe operating temperature of low-voltage paper insulated cables. (American Institute of Electrical Engineers, Transactions, New York, v. 40, 1921, p. 97–105; discussion, p. 177–203.) **† VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 134, *PAA.*

Effects of heating on the mechanical properties of petrolatum-resin impregnated papers.

376. Dunsheath, P. Fibres in oil. (Electrician, London, v. 86, 1921, p. 385–386.) **† VGA**

Describes tests in which cotton fibres were found to align themselves under the influence of high potentials, eventually forming a path for discharge.

1921, continued.

377. **Evans,** Elliot A. Lubricating and allied oils. London: Chapman and Hall, Ltd., 1921. xiv, 122 p. illus. 8°. **VON**

p. 87–92: Sludging of oil and tests therefor.

378. **Fahrenwald,** A. W. Surface-energy and absorption in flotation. (Mining and scientific press, San Francisco, v. 123, 1921, p. 227–234.) **† VA**

A study of the interfacial-tension theory as applied to various oils and emulsions. Bibliographical footnotes.

379. **Farmer,** F. M. How gap, temperature, etc., affect voltage test of oil. (Electrical world, New York, v. 78, 1921, p. 729–730.) **† VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 48, 1921, p. 1518, † *VGA.*

Conditions tested include type of gap, shape of electrodes, spacing of electrodes, number of shots, temperature and circulation of oil. Results tabulated.

380. **Fleming,** A. P. M., and ALLAN MONKHOUSE. Industrial research on pressboard. (Electrician, London, v. 87, 1921, p. 672–674.) **† VGA**

Abstracted in *Science abstracts,* London, v. 25-B, 1922, p. 98, *PAA.*

Method of manufacture; mechanical and electrical properties of samples of pressboard of different origins, in air and oil.

381. **Fleming,** R. T. Properties and characteristics of insulating materials. — Liquid insulation. (Institution of Electrical Engineers, Journal, London, v. 60, 1921, p. 62–64.) **VGA**

This portion of the paper deals with liquid insulations, including transformer and switch oils and varnishes employed in impregnating coils, etc.

382. **Flight,** William Stanley. The effect of heat on the insulating strength of some commercial insulating materials. (Institution of Electrical Engineers, Journal, London, v. 60, 1921, p. 218–235.) **VGA**

Abstracted in *Electrical review,* London, v. 91, 1922, p. 277–278, † *VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 40, 1922, p. 599, † *VGA.*

Results are given in tabulated form of investigations to determine the variation of dielectric strength of oil and of various materials in air and in oil when subjected to temperatures of from 30°C. to 100°C. In general dielectric strength was found to decrease with increase of temperature.

383. **Gittins,** G. E. Heating and cooling curves and their application to oil circuit-breakers. (Metropolitan-Vickers gazette, Manchester, v. 6, 1921, p. 107–110.) **VGA**

The author considers among other causes the losses due to heating of the tank and cover as a result of improper lining or improper circulation of the heated oil. Heating and cooling curves are shown for various parts, and a method is given for determining the watt loss due to the passage of an alternating flux.

384. **Granier,** J. Sur le tracé des cycles de viscosité diélectrique. (Revue générale de l'électricité, Paris, tome 10, 1921, p. 219–224.) **† VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 500, *PAA.*

Deals with the effect of viscosity on the cycles of polarization; this and other factors demand consideration in the choice of a ballistic galvanometer.

385. **Hapgood,** Cyrus Howard. Hehydration of transil oil by centrifugal force. (Electrical world, New York, v. 78, 1921, p. 473.) **† VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 43, 1922, p. 692, † *VGA.*

Relates the experience of the Central Hudson Gas and Electric Company, with a De Laval separator which is guaranteed to deliver an oil having a dielectric strength of at least 40,000-volts with the old style test cup, or 22,000-volts with the new style cup.

386. **Kehse,** Walter. Beginn der Streifenenladung in Luft und unter Öl. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 42, 1921, p. 1064–1066.) **† VGA**

Abstracted in *Science abstracts,* London, v. 25-A, 1922, p. 153.) *PAA.*

Study of the effect of varying spaces between live portions of tubes of various sizes and with various types of edges. Values of the voltages at which discharge commenced are given in tabulated form.

387. **McLaughlin,** Thomas A. The deleterious effects of fibres on the electric insulating power of oils. (Electrician, London, v. 86, 1921, p. 325–327; comment, p. 385–386.) **† VGA**

Abstracted in *Electrical world,* New York, v. 77, 1921, p. 918, † *VGA.*

Considers the effects of cotton fibres on the dielectric strength of oil, also of dust, moisture, and occluded air.

388. **Michaud,** F., and A. BALLOUL. Action d'un champ électrique sur un liquide isolant. (Académie des sciences, Comptes rendus, Paris, tome 173, 1921, p. 1165–1167.) **OA**

Abstracted in *Science abstracts,* London, v. 25-A, 1922, p. 153, *PAA.*

Based on work of Bouchet, *Comptes rendus,* tome 173, p. 914–916, *OA.*

389. **Muller,** Richard. Hydroelectrical engineering. A book for hydraulic and electrical engineers, students and others interested in the development of hydroelectric power systems. New York: G. E. Stechert & Co., 1921. xi, 431 p. illus. 8°. **VGMB**

p. 221–223: Forced oil-circulation cooling systems.

390. **Nuttall,** W. H. Insulating materials. (Electrician, London, v. 87, 1921, p. 184–185.) **† VGA**

Abstracted in *Science abstracts,* London, v. 25-B, 1922, p. 40, *PAA.*

A general discussion of the chemical and physical characteristics of oil varnishes and other insulating compounds.

391. **Rengade,** Étienne, and JEAN CLOSTRE. Sur le dosage de l'eau dans les huiles pour transformateurs. (Académie des sciences, Comptes rendus, Paris, tome 173, 1921, p. 311–313.) **OA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 499, *PAA; Society of Chemical Industry, Journal,* London, v. 40, 1921, p. 616a, *VOA; Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 3, Bd. 4, Teil 2, 1921, p. 1191, *VOA.*

A current of dried air is passed through heated oil, the issuing air is condensed in a U tube and the moisture weighed.

1921, continued.

392. **Rodman,** C. J. The determination of moisture in insulating oils. (Journal of Industrial and engineering chemistry, Easton, v. 13, 1921, p. 1149–1150.) † **VOA**

Abstracted in *Chemical abstracts,* Easton, v. 16, 1922, p. 393, *PKA.*

Method of distilling off moisture is described. Bibliography given.

393. —— Transformer oil sludge. (American Electrochemical Society, Transactions, New York, v. 40, 1921, p. 99–106; discussion, p. 106–108.) **PKA**

Abstracted in *Electrical world,* New York, v. 78, 1921, p. 836, † *VGA; Society of Chemical Industry, Journal,* London, v. 40, 1921, p. 740-A, *VOA; Science abstracts,* London, v. 26-B, 1923, p. 373, *PAA.*

Sludges are divided into three classes, described as the asphaltic, the soap, and the carbon. Asphaltic and soap sludges are produced most readily by oxidation of poor oil, containing unsaturates, water, small resinous bodies, and certain accelerators. The carbon sludge is produced during breakdown. Highly refined oil of the saturated paraffine series, which is carefully filtered when the dielectric strength begins to lower during operation, can be successfully used for many years.

394. **Sinclair,** C. T. Combating fires in transformers and oil switches. (Electrical world, New York, v. 78, 1921, p. 357–359.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 40, 1922, p. 9, † *VGA.*

Use of carbon tetrachloride, bicarbonate of soda and sulphuric acid, foamite, water, sand and wet sawdust studied with view toward determining effectiveness and protection of personnel.

395. **Specifications** approved for transformer oil. (Electrical review, Chicago, v. 78, 1921, p. 207.) † **VGA**

Specifications adopted by the Union des syndicats d'électricité; covers sludging, flash point, viscosity, evaporation, density and acidity.

396. **Steels,** O. Deux méthodes rapides pour la détermination de la densité des huiles de transformateurs. (Revue générale de l'électricité, Paris, tome 9, 1921, p. 715.) † **VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 394, *PAA.*

The first method is a particular application of the flotation method; the second method consists in balancing a column of water against 1000 mm. of oil, the density then being read directly from the graduate containing the water.

397. **Still,** Alfred. Bushings for insulation of high-voltage lines. (Electrical review, Chicago, v. 78, 1921, p. 217–220.) † **VGA**

A study of the effect of conductor size on dielectric stress for solid and oil-filled bushings.

398. **Torchio,** Phillip. Permissable operating temperatures of impregnated paper insulation in which dielectric stress is low. (American Institute of Electrical Engineers, Transactions, New York, v. 40, 1921, p. 107–129; discussion, p. 177–203.) **VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 133–134, *PAA.*

Effect of heating on oil impregnation compounds, p. 116, 124–127.

399. **Vereinigung der Elektrizitätswerke.** Neue Öllieferungsbedingungen. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 42, 1921, p. 1145.) † **VGA**

400. **Vidmar,** Milan. Die Transformatoren. Berlin: Julius Springer, 1921. xvi, 702 p. illus. 8°. **VGI**

p. 483–486: The oil transformer; p. 486–490: Insulating requirements of oils, heat transfer; p. 496–513: Design of tanks and cooling surfaces; p. 515–521: Cooling of oil by means of water.

401. —— Das Wärmestrahlungsproblem des Transformators. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 39, 1921, p. 65–69.) † **VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1921, p. 405, *PAA.*

A mathematical study of the cooling action of the component parts of oil- and air-cooled transformers.

402. **Waters,** Campbell Easter. The catalytic oxidation of petroleum oils. (Journal of Industrial and engineering chemistry, Easton, v. 13, 1921, p. 901–903.) † **VOA**

Abstracted in *Chemical abstracts,* Easton, v. 16, 1922, p. 158, *PKA.*

The effect of various metal and metallic oxide catalysts on the oxidation of two oils is determined.

403. **Wedmore,** E. B. A research on insulating oils. (Electrician, London, v. 87, 1921, p. 702–704.) † **VGA**

Same in *Electrical review,* London, v. 89, 1921, p. 687–689, † *VGA.* Abstracted in *Electrical world,* New York, v. 79, 1922, p. 93, † *VGA; Science abstracts,* London, v. 25-B, 1922, p. 98, *PAA.*

The author compares the results obtained by other workers on the breakdown voltages with various shapes and sizes of gaps; needle points, disk and needle point, and with disks and spheres. On the basis of the data collected, recommendations are made for a standard type of spark-gap for testing purposes.

1922

404. **American Institute of Electrical Engineers.** — Standards Committee: Wires and Cables Sub-committee. Rating of cables in relation to voltage. Summarized history of published knowledge bearing upon the performance of insulation under electric stress. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 542–546.) **VGA**

405. **Barbillion,** L. Transformateurs statiques de courants alternatifs. Paris: Albin Michel, 1922. 163 p. illus. 8°. **VGI**

p. 140–158: Cooling of transformers.

406. **British Electrical and Allied Industries Research Association.** Directions for the study of pressboard for electrical insulating purposes. (Institution of Electrical Engineers, Journal, London, v. 61, 1922, p. 486–495.) **VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 372–373, *PAA.*

Includes tests in oil, and tests for absorption of oil.

1922, continued.

407. **Bruehlmann,** G. L'influence des basses temperatures sur les huiles minerales dans les transformateurs et les interrupteurs; l'examen des huiles au froid. (Revue Brown, Boveri Cie., Baden, année 9, 1922, p. 14–19.) **VGA**

Same in *Petroleum,* Berlin, Jahrg. 19, 1923, p. 67–72, † *VHYA.* Abstracted in *Electrical world,* New York, v. 79, 1922, p. 642, † *VGA; Chemical abstracts,* Easton, v. 17, 1923, p. 1710, *PKA; Society of Chemical Industry, Journal,* London, v. 42, 1923, p. 299A, *VOA; Verein deutscher Ingenieure, Zeitschrift,* Berlin, Jahrg. 66, 1922, p. 809–810, † *VDA.*

The danger of thickening or freezing of oil in self-cooled transformers is not great, as the overheating, due to the impeded cooling action of the oil, is of comparatively short duration. It might become dangerous in forced oil-cooled transformers, as the thickened oil will find a great resistance in the flow through pipe lines. The heat generated by iron loss alone will prevent a transformer from freezing. Far greater is the danger of frozen oil in switches, as it will slow down the action of the contacts and will be much slower to flow between the contacts and to quench the arc. A simple cold test is described.

408. **Creighton,** E. E. F. On deviations from standard practice in lightning arresters. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 52–59; discussion, p. 59–62.) **VGA**

p. 58: Deterioration of oil and formation of sludge in aluminum arresters.

409. **Davies,** D. R. Considerations relating to the design of oil circuit-breakers. (Electrician, London, v. 88, 1922, p. 712–714; v. 89, 1922, p. 6–8, 95–97, 124–125.) † **VGA**

Abstracted in *Electrical world,* New York, v. 80, 1922, p. 236, 567, 619, † *VGA.*

Discusses heating of breaker parts and conductors during normal conditions and under short-circuit; the factors affecting the arcing time, relation between arc energy and kva. interrupting capacity; disintegration of the oil by arc, explosive pressures and repulsive effects of large currents; and gives a summary of the factors that determine the ultimate breaking capacity.

410. **Dawson,** C. The testing of materials used in the manufacture of electrical equipment. — Oils. (Institution of Electrical Engineers, Journal, London, v. 61, 1922, p. 62–63.) **VGA**

Electric strength, insulation resistance, viscosity, flash point, chemical reaction and sludge.

411. **Day,** David Talbot, editor. A handbook of the petroleum industry. New York: John Wiley & Sons, Inc., 1922. 2 v. illus. 8°. **VHY**

p. 704: "Determination of carbon residue;" p. 705: Test for oxidation and sludging characteristic; p. 706: Test for corrosion of metals.

412. **Delbridge,** T. G. The problem of durability tests for transformer oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 22, part 2, 1922, p. 532–537; discussion, p. 538–540.) **VEE**

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 1324, *PKA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 45, 1924, p. 1415, † *VGA.*

Deterioration of the oil during service is ascribed chiefly to oxidation yielding solids and viscous liquids which retard circulation, water which reduces dielectric strength, and acid bodies which do both. Standard tests for determining the presence of the above products are outlined with a view to standardizing methods.

413. **Del Mar,** William A., and C. F. Hanson. Effects of the composite structure of impregnated paper insulation on its electric properties. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 563–569, 611–627.) **VGA**

Experiments indicate that the electric failure of impregnated paper insulated cables is due to ionic motion in the oil; the construction and voltage rating of cables should be such that ionic motion is restrained.

414. **Du Bois,** Delafield. The action and effect of moisture in a dielectric field. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 591–600; discussion, p. 611–627.) **VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 41, *PAA.*

A mathematical study of the forces acting on a filament of moisture and of its behaviour under such stress.

415. **Estorff,** Walter. Der neue Ölprüfer der Siemens-Schuckertwerke. (Siemens Zeitschrift, Berlin, Jahrg. 2, 1922, p. 614–620.) **VGA**

Same in *Petroleum,* Berlin, Jahrg. 19, 1923, p. 334–338, † *VHYA.* Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 2205, *PKA; Electrical world,* New York, v. 81, 1923, p. 54, † *VGA.*

Consists essentially of a spark gap, one electrode of which is in air, the other immersed in oil. The voltage attained is indicated on a gage which is a measure of the gap at the voltage limit of the sample of oil under test.

416. **Farmer,** F. M. Tests for sludging of oil being investigated. (Electrical world, New York, v. 80, 1922, p. 179.) † **VGA**

Outlines the tests being conducted by various organizations on the question of oil sludging.

417. **Fleming,** A. P. M. Developments in insulating materials and processes. (Electrician, London, v. 89, 1922, p. 211–213.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 40, 1922, p. 589–590, † *VGA.*

418. **Flight,** William Stanley. Sparkover voltages through oil. (Beama, London, v. 10, 1922, p. 113–119, 217–223.) † **VGA**

Abstracted in *Electrical world,* New York, v. 79, 1922, p. 1133, † *VGA.*

The first portion of this article deals with the effects of various impurities in commercial insulating oils, methods of testing and of purifying. In the second portion consideration is given to the qualities and condition of the oil which contribute to its most efficient functioning as an insulating medium; under this head are included pressure of oil, the temperature of the oil, the effect of horizontal and vertical gap, and a consideration of the efficacy of oil in series with solid dielectrics. Bibliographical footnotes.

419. **Fowle,** Frank Fuller, editor. Standard handbook for electrical engineers, prepared by a staff of specialists. Frank F. Fowle, editor-in-chief. New York: McGraw-Hill

1922, continued.

Book Company, Inc., 1922. xviii, 2137 p. 5. ed. illus. 8°. **Desk–121**

p. 324–325: Electrical properties of oil; Effects of moisture and dust, Formation of deposits in oil-cooled transformers; p. 451–452: Dehydration of oil with the filter-press.

420. Gealey, E. J. Insulating oils are decomposed by passage of current; how to keep and restore their dielectric strength. (Coal age, New York, v. 22, 1922, p. 953–955.) **VHWA**

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 691, *PKA.*

Degeneration of oil is caused by two conditions; the heat and arc, and the entry of moisture; the first brings about changes in the molecular structure of the oil, the specific gravity, specific heat, volatility and dielectric strength are changed; moisture decreases dielectric strength. Methods of testing for impurities and loss of dielectric strength, and methods of purifying are discussed. Particular oil specifications are given for switches and for transformers.

421. Gibbs, J. B. The care of transformer oil. (Power, New York, v. 55, 1922, p. 256–257.) **† VFA**

Discusses effects of moisture and methods of preventing its entrance into the oil; sampling; testing and drying.

422. Guenther-Schulze, A. Die dielektrische Festigkeit von flüssigkeiten und festen Körpern. (Jahrbuch der Radioaktivität, Leipzig, Bd. 19, 1922, p. 92–112.) **PLE**

Study is made of the following liquids: turpentine, xylol, petroleum, benzol, paraffine oil and Gargoyle oil. Bibliography given.

423. Guilbert, C. F. Emploi des isolants dans les condensateurs électriques. (Revue générale de l'électricité, Paris, tome 11, 1922, p. 829–834.) **† VGA**

Abstracted in *Science abstracts,* London, v. 25-B, 1922, p. 488, *PAA.*

Discusses the danger of arcing at the edges of plates, and recommends that these parts be submerged in oil.

424. Hall, Claude Haynes, jr. The electrical precipitation of colloids. (American Chemical Society, Journal, Easton, v. 44, 1922, p. 1246–1249.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 16, 1922, p. 2434, *PKA.*

The author has investigated the effect of high potentials upon colloidal suspensions in insulating oils. No precipitation detected in the range 10^4–2×10^5 volts, either alternating or direct current. It is shown that the rate of precipitation would be 1/20000 of that for smoke for the same energy applied to the particle.

425. Hardin, L. H. Ready method of detecting moisture in transformer oil. (Electrical world, New York, v. 79, 1922, p. 734–735.) **† VGA**

By placing oil in a shallow pan and then heating by a blow-torch, bubbles of steam will be formed of the moisture; a rough idea of the amount of moisture may thus be gained from the amount and intensity of the bubbling.

426. Hayden, Joseph LeRoy, and W. N. Eddy. Five hundred tests on the dielectric strength of oil. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 102–103; discussion, p. 103–107.) **† VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 40, 1922, p. 443, *† VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 45, 1924, p. 564, *† VGA; Electrical world,* New York, v. 79, 1922, p. 382–383, *† VGA.*

Five hundred successive breakdowns were taken on a sphere-gap in oil at the same gap setting. Because of the well known inconsistency of breakdowns in oil these observations showed wide variation. A curve was plotted to show the relation between the breakdown voltage and the number of breakdowns at each voltage. If the disruptive breakdown of oil is due to the voltage exceeding the dielectric strength of the oil, as is the case with air, it should be possible to represent such a curve of probable error, but it was found that such a curve was higher than the observations. The explanation is offered that this discrepancy is caused by foreign particles being drawn into the gap, and that therefore the dielectric strength of oil differs from that of air in that it does not represent the true breakdown value of the oil but is instead a measure of the presence of foreign particles.

427. —— Three thousand tests on the dielectric strength of oil. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 394–398; discussion, p. 398–401.) **† VGA**

Abstracted in *Electrical world,* New York, v. 80, 1922, p. 77, *† VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 45, 1924, p. 564, *† VGA.*

Tests were made in six groups with 500 tests in each group under constant conditions of test. Three groups of tests were taken of standard insulating oil with three different shapes of the electrostatic field; small sphere gap, large sphere gap, and sphere-needle gap. One group of tests was made with commercial, and another with chemically pure benzol. Under successive tests, oil, first slowly and then more rapidly, deteriorates by carbonization due to the disruption. Benzol deteriorates very rapidly at first, then becomes fairly constant.

428. Hilliard, J. D. Tests on General Electric circuit-breakers at Baltimore. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 647–652; discussion, p. 662–669.) **† VGA**

Abstracted in *Electrical world,* New York, v. 80, 1922, p. 21–23, *† VGA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 44, 1923, p. 614–615, *† VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 41, 1923, p. 697–698, *† VGA; Science abstracts,* London, v. 25-B, 1922, p. 550, *PAA.*

Results are discussed concerning tripping speed, duration of arc, condition of oil, generation of gas and internal pressure, and the effects upon tanks and other structural parts of the breakers.

429. Holde, David. The examination of hydrocarbon oils and of saponifiable fats and waxes; authorized translation from the fifth German edition by Edward Mueller. New York: John Wiley and Sons, Inc., 1922. xix, 572 p. 2. Eng. ed. illus. 8°. **VON**

p. 63–68: Electrical tests and dielectric constants; p. 159–162: Requirements, properties and testing of transformer oils.

430. Jakob, Max. Messung des Wärmeleitvermögens von Flussigkeiten, Isolier-

1922, continued.

stoffen und Metallen. (Verein deutscher Ingenieure, Zeitschrift, Berlin, Bd. 66, 1922, p. 688–693.) † VDA

Abstracted in *Chemisches Zentralblatt*, Berlin, Folge 6, Jahrg. 4, Bd. 4, 1922, p. 606, *PKA; Society of Chemical Industry, Journal*, v. 41, 1922, p. 735A, *VOA; Elektrotechnik und Maschinenbau*, Wien, Jahrg. 37, 1919, p. 288, † *VGA*.

The temperature coefficient of the thermal conductivity of a transformer oil was found to be 3%.

431. Johansen, E. M. Iodine and bromine values of petroleum products. (Industrial and engineering chemistry, Easton, v. 14, 1922, p. 288–292.) † VOA

Describes method of determining absorption and compares results with those obtained with the Hanus, Wijs and Hubl methods. Bibliographies on iodine and bromine values given.

432. Lapp, G. W. An overpotential test for insulators. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 732–736; discussion, p. 736–740.) † VGA

In this test the insulator is placed in an insulating dish which holds a sufficient depth of oil to form an electrical flash-over seal at the rim of the insulator; by this method of testing the danger of flash-over is eliminated, and a definite chosen potential in excess of its highest normal flash-over may be applied to the insulator under test.

433. Lewis, W. W. Present status of high-voltage transmission of power. — Insulating oil and bushings. (General Electric review, Schenectady, v. 25, 1922, p. 681–686.) VGA

434. MacNeil, J. B. Tests on Westinghouse oil circuit breakers at Baltimore. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 653–662; discussion, p. 662–669.) † VGA

Abstracted in *Electrical world*, New York, v. 80, 1922, p. 21–23, † *VGA; Elektrotechnische Zeitschrift*, Berlin, Jahrg. 44, 1923, p. 614–615, † *VGA; Science abstracts*, London, v. 26-B, 1923, p. 104–105, *PAA*.

Among conditions noted during tests were duration of arc, condition of oil, formation of gas and its explosibility.

435. Mercier, H. Sur l'emploi de l'huile dans les transformateurs. (Revue générale de l'électricité, Paris, tome 12, 1922, p. 858–860.) † VGA

Abstracted in *Science abstracts*, London, v. 26-B, 1922, p. 196, *PAA*.

Discusses several requirements of the specifications for oil of the Union des syndicats de l'électricité, which he considers should be modified. The discoloration test, the tests for loss of weight by evaporation, and for density are unnecessary. Sludge allowance should be reduced from 0.3 to 0.25. Viscosity test should be carried out at 50°C. instead of at 20°C. Importance of preventing absorption of moisture and the use of a filter press are emphasized.

436. National Electric Light Association. —Electrical Apparatus Committee. Report. — Standardization of transformer oil. (National Electric Light Association, Proceedings, New York, 1922, part 2, p. 975–976.) VGS

Tabulated characteristics of General Electric no. 10 and 10-C; and Westinghouse Wemco A and Wemco A-1 oils.

437. Proper handling, care and testing of insulating oils. (Coal age, New York, v. 22, 1922, p. 491–493.) † VHWA

Abstracted in *Electrical world*, New York, v. 80, 1922, p. 892–893, † *VGA*.

Discusses the effect of moisture and sludge, precautions to be taken against the entry of moisture and methods of testing therefor. Tabulated record of samples taken from tops and bottoms of a number of transformers, showing the difference in dielectric strength. Cost of maintaining oil is considered.

438. Redwood, Sir Boverton. Petroleum: a treatise on the geographical distribution and geological occurrence of petroleum and natural gas; the physical and chemical properties, production, and refining of petroleum and ozokerite; the characters and uses; testing, transport, and storage of petroleum products; and the legislative enactments relating thereto; together with a description of the shale-oil and allied industries; and a bibliography. London: Charles Griffin & Company, Limited, 1922. 3 v. illus. 8°. VHY

p. 529–530: Physical properties, sludging and oxidation in the presence of copper and iron, bibliographical references; p. 887–889: "Switch and transformer oils"; oil cooling of transformers, flash point, viscosity, sludging, dryness of oil, dielectric strength and specific resistance.

439. Rodman, C. J. Arc action on some liquid insulating compounds. (American Electrochemical Society, Transactions, New York, v. 42. 1922, p. 305–316; discussion, p. 316–318.) PKA

Halogenated aliphatic and aromatic hydrocarbons, as well as mixtures of these with some mineral oils, were subjected to breakdown. Finely divided and highly non-conducting amorphous carbon, saturated and unsaturated hydrocarbons lower in the series, hydrochloric acid (from chlorinated compounds) and a number of gases were obtained. These gases consisted chiefly of hydrogen, and unsaturated with small amounts of carbon monoxide, carbon dioxide, methane and nitrogen.

440. —— Oil qualities desirable for transformers and circuit-breakers. (Electrical world, New York, v. 79, 1922, p. 1271–1273.) † VGA

For comment by F. M. Farmer see *Electrical world*, New York, v. 80, 1922, p. 179.

Abstracted in *Elektrotechnik und Maschinenbau*, Wien, Jahrg. 40, 1922, p. 507, † *VGA*.

A study of the theoretical and practical behaviour of oils under service conditions covering explosive limits, dielectric strength, and sludging properties.

441. Sampson, E. R. Care of transformer oil. (Electric journal, Pittsburgh, v. 19, 1922, p. 125–126.) VGA

Methods of testing, handling and purifying transformer oil.

442. Schwaiger, Anton. Beitrag zur elektrischen Festigkeitslehre. (Archiv für Elektrotechnik, Berlin, Jahrg. 11, 1922, p. 41–50.) VGA

Abstracted in *Science abstracts*, London, v. 25-B, 1922, p. 389–390, *PAA*.

A study of the effect of various relative positions of gaps on dielectric value.

1922, continued.

443. **Schwarz,** F., and J. Marcusson. Die Bestimmung der Verteerungszahl von Transformatoren- und Turbinenöl. (Petroleum, Berlin, Jahrg. 18, 1922, p. 741–742.) **VHYA**

Abstracted in *Chemical abstracts,* Easton, v. 16, 1922, p. 4055, *PKA; Society of Chemical Industry, Journal,* London, v. 41, 1922, p. 535A, *VOA; Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 4, Bd. 4, 1922, p. 336–337, *PKA.*

Describes the benzol method of tar-number determination.

444. **Shanklin,** G. B. Bibliography on the heating of cables. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 99–100.) **VGA**

59 entries divided into sections covering A.I.E.E. papers, and articles in French and German periodicals.

445. **Shrader,** J. E. Determination of water in transformer oil. (Electrical world, New York, v. 174, 1922, p. 174–175.) **† VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 43, 1922, p. 765, † *VGA.*

A method developed by the Westinghouse Electric and Manufacturing Company laboratories which consists in spraying the oil into a vacuum system and into a heated tube where under the influence of heat and vacuum the moisture is completely vaporized and separated from the sample. By condensing and isolating this vapor in a part of the vacuum system where it is allowed to reexpand in a known volume, its pressure, together with that of the oil, is determined. By determining these pressures and by using Boyle's law the amount of water can then be calculated.

446. **Simons,** Donald M. Rating of cables in relation to voltage. Bibliography on dielectrics. (American Institute of Electrical Engineers, Transactions, New York, v. 41, 1922, p. 601–610.) **† VGA**

447. **Staeger,** Hans. Huiles de transformateurs et modifications de leurs propriétés sous l'action de la chaleur. (Revue Brown, Boveri Cie., Baden, année 9, 1922, p. 159–167.) **VGA**

Same in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 44, 1923, p. 73–78, † *VGA.* Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 235, *PAA; Electrical world,* New York, v. 80, 1922, p. 948, † *VGA.*

A discussion of the sources and characteristics of the oils used in transformers, and of the chemical change in the oil under service conditions. The French, German, British and Brown Boveri sludge tests are outlined and a comparison of results on three oils is given. The Brown Boveri test is used to study the effects of air and copper, and the reaction of the oil and cotton.

448. **Stern,** Georg. Transformatoren- und Schalteröle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 43, 1922, p. 140–143.) **† VGA**

See also comment by H. Schonger, p. 416; by W. Hüter, p. 951–952.

Abstracted in *Science abstracts,* London, v. 25-B, 1922, p. 246–247, *PAA.*

Critical discussion of the specifications of the Vereinigung der Elektrizitätswerke for oils, they having been made on the basis of Russian oils, whereas the supply then available was derived from American petroleum. Reference is made only to mineral oils, although resin oils are not condemned for transformer use. Viscosity, specific gravity, flash point, cold point, evaporation, moisture content, acidity, dielectric strength and methods of shipping are considered.

449. **United States.** — Federal Specifications Board. Specifications for petroleum products. Transformer oil. (In: United States. — Bureau of Mines. Technical paper 305, Washington, 1922, p. 29.) **VHCA**

450. **Vereinigung der Elektrizitätswerke.** Untersuchungsmethoden für Transformatoren- und Schalteröle. (Ingenieur-Zeitschrift, Teplitz-Schönau, Jahrg. 2, 1922, p. 254–256.) **VDA**

Reprint of Vereinigung der Elektrizitätswerke, Mitteilungen no. 312. Covers shipping, specific weight, viscosity, flash point, cold point, acidity, alkalinity, ash content, and tar number.

451. **Waters,** Campbell Easter. Sulfur compounds and oxidation of petroleum oils. (Industrial and engineering chemistry, Easton, v. 14, 1922, p. 725–727.) **† VOA**

Abstracted in *Chemical abstracts,* Easton, v. 16, 1922, p. 3752, *PKA.*

Mineral oils containing large percentages of sulphur compounds are more easily oxidized than those in which there is less sulphur. The bearing of this fact on the formation of sludge in transformer oils is pointed out.

452. **Wedmore,** E. B. Insulating oils. — Colour and sludging characteristics. (Institution of Petroleum Technologists, Journal, London, v. 8, 1922, p. 67–72.) **VHYA**

Samples of oils were sludged at 60°, 70°, 80°, 90°, 100°, and 120° for 45 hours or more. Oils tested are as follows: Gargoyle A, Gargoyle AF, Gargoyle MS, Immutol, Reesileo S.O.X., Reesileo AB2 and Stern Sonneborn X 26097. Describes the Lovibond tintometer used in these tests.

453. **Zipp,** H. Beitrag zur Frage der elektrischen Prüfung von Transformatoren- und Schalterölen. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 40, 1922, p. 579.) **† VGA**

Same in *Ingenieur-Zeitschrift,* Teplitz-Schönau, Jahrg. 3, 1923, p. 279–281, 312–313, *VDA.*

Condensed form of paper no. 320 of the Vereinigung der Elektrizitätswerke, Jahrg. 21, Sept., 1922.

1923

454. **American Society for Testing Materials.** Report of Committee D-9 on electrical insulating materials. (American Society for Testing Materials, Proceedings, Philadelphia, v. 23, 1923, p. 431–447.) **VEE**

Covers solid and liquid insulation; in the latter, attention was paid chiefly to sludging and tar formation of transformer oil. Tests recommended which are modifications of the Michie and German "9" tests. For complete method and results see entry number 508.

455. **British Electrical and Allied Industries Research Association.** Report on the chemical and physical properties of insulating oils. (Institution of Electrical Engineers, Journal, London, v. 61, 1923, p. 661–674.) **VGA**

Abstracted in *Electrical review,* London, v. 93, 1923, p. 127–128, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 463–464, *PAA; Chemical abstracts,* Easton, v. 18, 1924, p. 1382, *PKA.*

After a brief resumé of experimental work on the subject, a general discussion of tests for, and con-

1923, continued.

clusions drawn from the tests, are outlined for sludging, tintometric determination of sludging characteristics, evaporation, flash point, viscosity, chemical reactions, volumetric expansion, solidification, vapor pressure and the action of catalyzers.

456. **British Engineering Standards Association.** Tentative British standard specification for insulating oils for use in transformers, oil switches and circuit-breakers. London: Published for the Association by C. Lockwood & Son, 1923. 24 p. illus. 8°. ([Report.] no. 148.) **VDC**

Abstracted in *Electrical review,* London, v. 92, 1923, p. 753, † *VGA.*

457. **Brown,** Ralph. Testing transformer cooling coils. (Power, New York, v. 58, 1923, p. 948.) **† VFA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 183, *PAA.*

Describes a pressure test for oil insulated, water cooled transformers to detect any leaks between the oil and water.

458. **Bruehlmann,** G. Interrupteurs dans l'huile à grande puissance de rupture. (Revue BBC, Baden, année 10, 1923, p. 45–49.) **VGA**

Same in English in † *VBA, p.v.138, no.8.*

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 412–413, *PAA.*

In this portion of the paper the author discusses the conditions present when an arc is ruptured in oil, considering the formation of gas and its possible ignition, the pressure imposed upon the oil and through it to the tank or explosion chamber, and the conditions which determine the duration and shape of the arc.

459. **Buck,** Theodor. Öl als Dielektrikum. (Elektrische Betrieb, München, Jahrg. 21, 1923, p. 195–197.) **VGA**

Outlines the general requirements of insulating oils, and discusses the dielectric properties of oil with various types of series insulation and with variously shaped electrodes and cylinders.

460. **Casimir,** E. Ueber die Teerzahlbestimmungen in Mineralölen. (Petroleum. Berlin, Jahrg. 19, 1923, p. 763–765.) **VHYA**

For comment by Heyden and Typke see p. 949.

A comparison of the Holde method, the Marcusson-Schwarz petroleum ether extraction method and of the Kramer C_6H_6 method for determination of tar number.

461. **Charpentier,** P. Dimensionnement, construction et détermination des disjoncteurs à huile. (Revue générale de l'électricité, Paris, tome 13, 1923, p. 737–745.) **† VGA**

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 1480, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 411–412, *PAA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 44, 1923, p. 1081, † *VGA.*

The author gives a formula for determining the amount of gas formed under given conditions; the size of this gas pocket determines the minimum distance between contacts when open and between live parts and the tank.

462. **Churcher,** E. G. The calibration of oil-immersed water-cooled standard low resistances. (Electrician, London, v. 91, 1923, p. 360–361.) **† VGA**

Correction made for the temperature rise of the material above that of the oil for a given current as affected by the thermal conductivity of the oil which depends upon the density, specific heat and viscosity. Tests were also conducted to determine the effect of rate of circulation of oil and of the direction of rotation of the stirrer on the thermal conductivity.

463. **Cole,** H. L. The oil-insulated transformer with forced oil circulation. (Electric journal, Pittsburgh, v. 20, 1923, p. 167–171.) **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 71, *PAA.*

Describes the units which comprise a water-cooled, forced-oil cooling system as recently developed for large units; the method of operation and measurements of temperature of the oil at various points in the system are given.

464. **Crussard,** P. Études sur les huiles transformateurs, qualités nécessaires et méthodes d'analyses. (Revue générale de l'électricité, Paris, tome 13, 1923, p. 443–449.) **† VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 305, *PAA.*

Compares the specifications and tests adopted by the Union des syndicats de l'électricité, the English sludge test, the German sludge tests, and the Brown, Boveri test. Consideration is also given to the action on cotton insulation by the acid products of oxidation and sludging.

465. **Dann,** Walter M. A new type of transformer designed to conserve oil and eliminate explosions. (Electric journal, Pittsburgh, v. 20, 1923, p. 53–56.) **VGA**

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 588, † *VGA.*

Describes the principle and the advantages of the inertaire transformer.

466. —— Venting of transformers direct to air. (Electrical world, New York, v. 81, 1923, p. 1280–1281.) **† VGA**

Does not advocate open ventilation because of the increased oxidation.

467. The **Dehydration** of insulating oil. (Electrician, London, v. 91, 1923, p. 520–521.) **† VGA**

Discusses the application of the De Laval machine to the purification of insulating oil.

468. **Demuth,** Walter, and others. Die Materialprüfung der Isolierstoffe der Elektrotechnik. Berlin: Julius Springer, 1923. viii, 254 p. illus. 8°. **VGM**

p. 183–189: "Verwendungs- und Lieferungsbedingungen. Transformatoren- und Schalteröle." p. 184–185: "Technische Bedingungen für in Kesselwagen oder eisernen Fässern angelieferte Mineralöle für Transformatoren und Schalter" (Vereinigung der Elektrizitätswerke); p. 186–189: (Union des syndicats de l'électricité).

p. 200–238: "Prüfung der Öle und Lacke." p. 201: "Aussere Beschaffenheit"; p. 202–203: "Spezifisches Gewicht"; p. 203–204: "Bestimmung der Ausdehnungskoeffizienten"; p. 204–208: Flüssigkeitsgrad"; p. 213–217: "Stockpunkt"; p. 217:Tropfpunkt"; p. 220–223: "Wassergehalt"; p. 223: "Säurezahl"; p. 224–225: "Harzöl"; p. 225: Schwefelgehalt"; p. 226–227: "Gehalt an freiem Alkali, Aschegehalt, Asphaltgehalt, Verteerungszahl."

p. 242–248: "Elektrische Prüfungen." p. 243: "Oberflächenwiderstand, Durchgangswiderstand;" p. 244: "Dielektrizitätskonstante," p. 245: "Dämpfung;" p. 245–248: "Durchschlagsfestigkeit."

1923, continued.

469. Eschholz, O. H. Causes and prevention of explosions in power transformers. (Electrical world, New York, v. 82, 1923, p. 423–425.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 41, 1923, p. 708, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 541, *PAA.*

The chief cause of transformer explosions is given as the mixture of hydrogen with oxygen, the former being liberated from the oil by arc; this cause may be removed by the use of conservators and by maintaining an inert gas over the oil.

470. Estorff, Walther. Behandlung und über Wachung von Isolierölen im Betriebe. (Elektrotechnische Zeitschrift, Festschrift, Berlin, Aug. 26, 1923, p. 29–34.) † **VGA**

Discusses the conditions which cause the breakdown of oil in service, chiefly the absorption of moisture and oxidation with the subsequent formation of coke-like and tarry sludge products. Methods of testing and purification are considered.

471. —— Ölprufer zur Bestimmung der dielektrischen Festigkeit von Isolierölen. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 44, 1923, p. 1111–1112.) † **VGA**

Describes a Siemens-Schukert oil testing set with a secondary transformer voltage of 30,000-volts.

472. Favors the venting of transformers. (Electrical world, New York, v. 81, 1923, p. 753.) † **VGA**

By having open vents the Southern Power Co. finds that oil vapors are readily dissipated.

473. Flight, William Stanley. Electrical insulation; the functions and characteristics of electrical insulating materials (solid, liquid and gaseous); the testing of these materials; and their use in the insulation of electrical machinery and apparatus. London: Sir I. Pitman & Sons, Ltd., 1923. xi, 107 p. diagrs., tables. illus. 16°. **VGM**

Bibliography, p. 101–104.

474. Foley, H. S. Forced-oil-cooling system for transformers. (Electrical world, New York, v. 82. 1923, p. 1227.) † **VGA**

Two Griscol-Russel coolers are used to cool the oil supply.

475. Gruen, Ad., and E. Ulbrich. Zur Oxydation des Paraffins mittels Luftsauerstoff. (Zeitschrift für angewandte Chemie, Leipzig, Jahrg. 36, 1923, p. 125–126.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 1782, *PKA.*

The authors found that when paraffins were heated to 170° the acids formed upon oxidation increased with the amount of air and the time of oxidation. Traces of moisture in the air increased the effect, while carbon dioxide retarded it.

476. Hapgood, Cyrus Howard. Process of purifying and dehydrating switch oil. (United States Patent 1460718. July 3, 1923.)

Brief description in *Chemical abstracts,* Easton, v. 17, 1923, p. 2956, *PKA.*

A process of purifying and dehydrating oil containing carbon and water by making a mixture of the oil with soap, subjecting the mixture to centrifugal force to eliminate the carbon, dirt, soap and a large part of the water, and subjecting the thus partially dehydrated oil to centrifugal dehydration.

477. Hayden, Joseph LeRoy, and W. N. Eddy. Dielectric strength ratio between alternating and direct voltages. (American Institute of Electrical Engineers, Transactions, New York, v. 42, 1923, p. 593–599; discussion, p. 615–620.) † **VGA**

Same in *General Electric review,* Schenectady, v. 26, 1923, p. 645–652, *VGA.*

Abstracted in *Electrical world,* New York, v. 82, 1923, p. 15, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 573–574, *PAA.*

Ratios less than unity were given by oils, petrolatum, powdered glass, etc., that is, they stood higher alternating than direct voltage, though the difference rarely exceeded 10 per cent.

478. Hayden, Joseph LeRoy, and Charles P. Steinmetz. High voltage insulation. — Liquid dielectrics. (American Institute of Electrical Engineers, Transactions, New York, v. 42, 1923, p. 1029–1041; discussion, p. 1041–1042.) † **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 219, *PAA.*

By plotting the breakdown voltages in 100 successive tests of oil, a wide deviation was found to exist as compared to tests in air. This is explained on the basis that the breakdown of an oil gap is the result of the presence of foreign bodies of different conductivity or specific capacity, causing local high densities at which disruption begins.

479. Hiecke, Rich. Die Transformatoren- und Schalteröle. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 41, 1923, p. 686.) † **VGA**

Discusses the Schied and other tests of oils.

480. Hill, L. H. Inert gas over oil in new transformer. (Electrical world, New York, v. 81, 1923, p. 747–749.) † **VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 304, *PKA.*

Eliminates oxidation of oil and serves as cushion to relieve tank during internal explosions. Bibliographical footnotes.

481. Horizontal v. vertical electrodes for oil testing. (Metropolitan-Vickers gazette, Manchester, v. 7, 1923, p. 412–414.) **VGA**

Records the results of experiments designed to determine the difference in results obtained with different arrangements of electrodes. In six cases the vertical position gives higher values than the horizontal; in twelve cases the horizontal gives higher values than the vertical, and in two cases the results are the same.

482. Les **Huiles** minérales des transformateurs et interrupteurs et les basses températures. (L'Électricien, Paris, série 2, tome 54, 1923, p. 199–200.) † **VGA**

The cooling of oil in switches retards the action of the mechanism resulting in dangerous arcing and local heating; in transformers local overheating of windings and oil is a danger due to the impeded circulation through pipes and cooling tubes.

483. Jones, S. F. Centrifugal oil purifier proves satisfactory. (Electrical world, New York, v. 82, 1923, p. 664.) † **VGA**

Experience of the Seattle, Wash., City Lighting Department with a De Laval separator.

484. Kryspsin, J. Chemical testing of transformer oils. (Chemical abstracts, Easton, v. 17, 1923, p. 2021.) **PKA**

Abstract of Rept. Fuel Tech. Inst. Czech. Polytechnic High School in Prague for 1921, 73–80 (1922).

1923, continued.

485. Kuechler, Rud. Vorausbestimmung der stationären Erwärmung des selbstkühlenden Öltransformators. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 44, 1923, p. 54–59.) † **VGA**

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 588, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 328, *PAA.*

The author develops formulas for the calculation of the heating of tanks, cores and windings of core-type, oil-immersed, self-cooled transformers. Sixty per cent of actual measurements checked with formulas to within one per cent.

486. Lewkowitsch, Julius Isidor. Chemical technology and analysis of oils, fats and waxes. Sixth edition entirely revised by George H. Warburton. London: Macmillan and Co., Limited, 1921–23. 3 v. illus. 8°. **VON**

v. 3, p. 83–84: Requirements of transformer oils; p. 84–96: Testing for adulterants and impurities of oils.

487. Luke, George E. The cooling of electric machines. (American Institute of Electrical Engineers, Transactions, New York, v. 42, 1923, p. 636–651; discussion, p. 651–652.) † **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 174–175, *PAA.*

Considers the various methods of disposal of heat losses, coefficient of heat transfer and dissipation from variously shaped and colored solids, and by water and oil. Bibliography.

488. Maintaining dielectric strength of transformer oil. (Electric railway journal, New York, v. 61, 1923, p. 471–473.) † **TPB**

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 698–699, † *VGA.*

By the use of the centrifugal separator.

489. Mandi, A. Neuere Ansichten über den Durchschlag fester Isoliermaterialien. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 41, 1923, p. 677–680.) † **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 217, *PAA.*

In the first portion of this paper a brief survey is given of potential gradient in the case of series dielectrics, as in the case of paper and oil; the remainder is devoted exclusively to solids.

490. Marx, Alfred, and Jean Rozières. Purification des liquides par l'action simultanée de la force centrifuge et du champ électrique. (Académie des sciences, Comptes rendus, Paris, tome 176, 1923, p. 1396–1398.) **OA**

Same in *Chimie et industrie,* Paris, v. 10, 1923, p. 218–220, *VOA.*

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 2758, *PKA.*

The simultaneous application of a centrifugal force and an electric field precipitates colloidal suspensions which are not affected by either separately.

491. Matthis, Alfred R. Les huiles pour transformateurs. (Revue générale de l'électricité, Paris, tome 13, 1923, p. 582–583.) † **VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 372, *PAA.*

Advocates precise measurements of dielectric strength of oils rather than bromine or iodine tests as a means of determining the presence of unsaturated hydrocarbons which result in sludging.

492. Meares, John Willoughby, and Reginald E. Neale. Electrical engineering practice. A practical treatise for electrical, civil, and mechanical engineers. London: Chapman & Hall, Ltd., 1923. 2 v. 4. ed. illus. 8°. **VGMB**

v. 1, chapter 77: (1) "Transformer and switch oil;" (2) "Carbon tetrachloride." Requirements, characteristics and applications.

493. Miller, J. A., jr. Maintaining dielectric strength of oil. (Electrical world, New York, v. 81, 1923, p. 698–699.) † **VGA**

Same in *Electric railway journal,* v. 61, 1923, p. 471–473, † *TPB.*

Dehydration of transformer oil by centrifugal separator is advocated on the score of speed and economy.

494. Moody, Walter S. Large power transformers. (General Electric review, Schenectady, v. 26, 1913, p. 344–347.) **VGA**

Abstracted in *Science abstracts,* London, v. 26-B, 1923, p. 418, *PAA.*

Details of tank construction are given with comparisons of water- and self-cooled designs. Outlines the general properties desirable in transformer oils. Discusses absorption of moisture, sludging, formation of acids and the causes of overheating, fire and explosion.

495. Moore, E. J., and J. H. Moulton. Effects of various colored cases on the oil temperature of distribution transformers. (Journal of electricity, San Francisco, v. 50, 1923, p. 433–434.) † **VGA**

Tabulated record of test data obtained by the San Joaquin Light and Power Corporation on transformers under various conditions of load.

496. Muellner, Friedrich. Die Messung von Strömungsgeschwindigkeiten. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 41, 1923, p. 209–210.) † **VGA**

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 1287, † *VGA.*

Two new methods are given for measuring the speed of the oil flow in transformers caused by the heating of the windings. By the first method the time is determined which it takes for a thermometer to drop from a preheated point down to the temperature of the flowing oil. The faster the oil flows the faster the mercury will drop. The second method is electrical and consists in inserting a small ball of fine copper wire in the oil and measuring the number of watts required to maintain the ball at a constant temperature. Calibration curves are given for both methods.

497. Philipp, A. Dosage de petites quantités d'eau dans les huiles pour transformateurs. (Revue de chimie industrielle, Paris, année 32, 1923, p. 226.) † **VOA**

Translated and condensed form of article in *Bayerischen Industen und Gewerbeblatt,* 1922. For abstract of process see *Chemical abstracts,* Easton, v. 17, 1923, p. 3784–3785, *PKA.*

498. Pittman, Ralph. Effective oil-testing apparatus. (Electrical world, New York, v. 82, 1923, p. 186.) † **VGA**

Comment on p. 608.

An improved set.

1923, continued.

499. **Purifying** transformer oils. (Electrical world, New York, v. 82, 1923, p. 338–339.) † VGA

Tabulated record of several companies gives experiences with and dehydration requirements of filter presses. Actual tests on two types of centrifugal purifiers.

500. **Rebora,** Gino. Raffreddamento naturale delle casse per transformatori in olio. (L'Elettrotecnica, Milano, v. 10, 1923, p. 406–411.) 3–VGA

Abstracted in *Electrical world,* New York, v. 82, 1923, p. 396, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 482, *PAA.*

The author reviews the theories of cooling applicable to transformer tanks, and methods of determining the maximum temperature of oil in tanks of various types.

501. **Reed,** Emerson G. The essentials of transformer practice. A treatment of the theory, design and operation of the transformer from a practical engineering viewpoint, prepared primarily for the engineering student and the designing and operating engineer. New York: D. Van Nostrand Company, 1923. x, 265 p. illus. 8°. VGI

p. 102–104: Heating; p. 104–105: "Initial rate of temperature rise;" p. 105–106: "Final temperature rise of the oil;" p. 106: "Temperature gradient between windings and oil;" p. 111–115: "Heating curve;" p. 115–117: "Cooling curve;" p. 117–119: "Overload temperature rise curves;" p. 128–129: "Effect of temperature on the mechanical strength of paper and cotton fiber heated under oil;" p. 136–139: "Properties of insulating oils."

502. **Rice,** Chester W. Free and forced convection of heat in liquids and gases. (American Institute of Electrical Engineers, Transactions, New York, v. 42, 1923, p. 653–702; discussion, p. 702–706.) † VGA

Abstracted in *Science abstracts,* London, v. 27-A, 1924, p. 307, *PAA.*

Tests were conducted with transil oil no. 10 on the convection from a horizontal grid of silver wires. The ambient oil temperature was measured and the temperature of the grid determined by the resistance method, the data gained was tabulated and the thermal conductivity calculated for the oil, and in addition for toluene, glycerine, carbon tetrachloride, analine and olive oil. Reviews Langmuir's film theory of convection, offers additional evidence in its favor, and extends its application to the determination of forced convection. In discussion by author (p. 705) it is stated, "The more general theory of the present paper shows that *free convection* tests can *not be used* as a *primary method of obtaining heat conductivities."* Thermal conductivities for the above liquids are recalculated. Bibliography.

503. **Rodman,** C. J. Durable insulating oils. (Electric journal, Pittsburgh, v. 20, 1923, p. 51–53.) VGA

Abstracted in *Electrical world,* New York, v. 81, 1923, p. 530, † *VGA; Science abstracts,* London, v. 26-B, 1923, p. 527–528, *PAA.*

Outlines the requirements and characteristics of an ideal liquid dielectric for breaker and transformer use, and advances general specifications for mineral oils for this use. The chief problem in the use of mineral oils is that of obtaining an oil which will be stable under operating conditions; in this connection consideration is given to the catalytic oxidation and formation of sludge in the presence of copper, iron, brass, lead, tin, resins, oxidized varnishes, and impregnation compounds. In switches deterioration is caused by arcing, resulting in gases and carbon; a table gives the explosive limits of the gases, the carbon formation is not serious, the electric field in the oil is not of itself harmful.

504. —— Sludge formation in transformer oil and solubility thereof. (Electrical world, New York, v. 81, 1923, p. 921–922.) † VGA

Samples of transformer oil were heated in air, diluted with petroleum ether, the sludge separated by a Gooch filter and the filtrate treated by the Babcocks absorption method for unsaturated constituents. Results tabulated. Parallel runs were made with nitrogen and carbon dioxide but no sludge resulted.

505. **Rushmore,** David Barker, and Eric A. Lof. Hydro-electric power stations. New York: John Wiley & Sons, 1923. viii, 830 p. 2. ed. illus. 8°. VGMB

p. 448–468: "Transformers. Oil." p. 448–449: Quality of oil as affected by viscosity, flash point, deposits, acidity, alkalinity, the presence of sulphur; p. 449–452: Thermometers and temperature indicators; p. 452–457: Drying of transformers; p. 457–460: Filtering of oil; p. 460–463: Testing for dielectric strength; p. 463–469: Methods of cooling oil and forced oil cooling systems.

506. **Schroeter,** F. Reinigung und Durchschlagfestigkeit von Transformatorenöl. (Archiv für Elektrotechnik, Berlin, Bd. 12, 1923, p. 67–77.) VGA

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 44, 1923, p. 525, † *VGA; Elektrotechnik und Maschinenbau,* Wien, Jahrg. 41, 1923, p. 455–456, †*VGA; Science abstracts,* London, v. 26, 1923, p. 373, *PAA.*

A specially built transformer and gap are described. Oil filtered by various methods is tested and the results given graphically. Microphotographs of the gap show the formation of bridges by fibrous materials and moisture in the oil.

507. **Skinner,** M. E. Drying transformers. (Electrical world, New York, v. 82, 1923, p. 901–903, 965–968.) † VGA

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 119, *PAA.*

Deals with methods of drying transformer windings and tanks, methods of tanking, and precautions to be observed in heating windings and in first filling of tank.

508. **Snyder,** E. A. Method for determining sludging properties of transformer oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 23, part 1, 1923, p. 448–450.) VEE

Consists essentially of an oven in which samples are exposed to air at 120° C. maintained constant. At periodic intervals specimens are subjected to centrifugal motion at 1800 r.p.m. for twenty minutes. The number of days required for sludge to form is considered as equivalent to the time for sludge to form if used in transformers.

508a. —— Methods for determining sludging properties of transformer oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 23, 1923, part 1, p. 451–455.) VEE

Gives revised methods adopted for sludging characteristics of oils. Tests considered are based on Michie test, formolite test and the German "9" test.

509. —— A method for measuring power factor and dielectric constant of insulating materials at commercial frequencies.

1923, continued.

(American Society for Testing Materials, Proceedings, Philadelphia, v. 23, part 1, 1923, p. 456–460.) **VEE**

Describes condenser and method of use for liquids and for materials which become fluid upon heating.

510. **Spath,** Walter. Über die Durchschlagseigenschaften von Transformatorenölen. (Archiv für Elektrotechnik, Berlin, Bd. 12, 1923, p. 331–345.) **VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 44, 1923, p. 950, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 10, *PAA.*

A general study of the breakdown voltage of oil with gaps of various diameters, and with various percentages of moisture and dirt in the oil. When tests were conducted with direct-current, polarity occurred, lowering the breakdown value by as much as 50%. Testing gap is described.

511. **Staeger,** Hans. Die Charakterisierung der Transformatorenöle. (Helvetica chimica acta, Geneva, v. 6, 1923, p. 62–86.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 1851, *PKA; Society of Chemical Industry, Journal,* London, v. 42, 1923, p. 257A, *VOA; Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 5, Bd. 2, 1923, p. 696–697, *PKA.*

Tests were made on six samples of commercial insulating oils for oxidation, sludge formations and interaction with other insulating materials at high temperatures in the presence of oxygen and various metals. Two types of sludges were formed, one soluble in oil, the other insoluble. Cotton insulation was found to be attacked, compounds resembling oxycellulose being formed. Sludging test is described.

512. —— Die Methylalkoholextraktion bei Mineralölen. (Helvetica chimica acta, Geneva, v. 6, 1923, p. 893–900.) **PKA**

Abstracted in *Society of Chemical Industry, Journal,* London, v. 42, 1923, p. 1117A, *VOA.*

Samples of oils were tested to determine chiefly the nature of sludges formed, and the other products of oxidized oil. Determinations were made and tabulated for acid number, tar number, index of refraction, specific gravity, and formolite number.

513. —— Die Schammbildung bei Transformatorenölen. (Helvetica chimica acta, Geneva, v. 6, 1923, p. 386–396.) **PKA**

Abstracted in *Chemical abstracts,* Easton, v. 17, 1923, p. 2639–2640, *PKA; Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 5, Bd. 4, 1923, p. 34, *PKA; Society of Chemical Industry, Journal,* London, v. 42, 1923, p. 640A, *VOA.*

"The decomposition of mineral oils used in...transformers takes place owing to autoxidation combined with polymerization and condensation reactions. Asphalt combinations and asphaltogen acids are formed, also oil soluble acids and cyclic unsaturated combinations which are soluble in oil. By acetone extraction considerable amounts of unsaturated cyclic compounds may be removed. This class of compounds tends strongly toward acid formation." — *Chemical abstracts* loc. cit.

514. **Stern,** Georg. Grosstransformatoren. (Elektrotechnische Zeitschrift, Festschrift, Berlin, Aug. 26, 1923, p. 23–29.) **† VGA**

After dealing at considerable length with the construction of the transformer itself, the author describes a recently developed type of oil cooling system which is external to the transformer tank and through which the oil is circulated by a pump.

515. —— Ueberlastung von Oel-Transformatoren. (Ingenieur-Zeitschrift, Teplitz-Schönau, Jahrg. 3, 1923, p. 356.) **VDA**

Studies the heating of copper and oil and the effects on the dielectric strength of the latter under overload conditions.

516. **Terminal** modification that eliminated breakdown. (Electrical world, New York, v. 81, 1923, p. 457–458.) **† VGA**

Arc-overs occurred on circuit-breaker bushings due to the formation of carbon deposits from the oil. A slight change made in the construction of the bushing entirely eliminated this condition.

517. **Testing** transformer oil in the field. (Electrical world, New York, v. 81, 1923, p. 638.) **† VGA**

Describes the routine adopted by the Southern Power Co. for maintaining the dielectric value of oil; all tests are recorded on a specially developed card and kept on file.

518. **Transportabler** Ölfilterapparat. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 44, 1923, p. 715.) **† VGA**

Describes a Brown, Boveri portable filter-press.

519. **United States.** — Federal Specifications Board. Specifications for petroleum products and methods for testing. Electric switch oil. (United States. — Bureau of Mines. Technical paper 323, Washington, 1923, p. 25.) **VHCA**

520. **Verband deutscher Elektrotechniker.** — Kommission für Isolierstoffe. Vorschriften für Transformatoren- und Schalteröle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 44, 1923, p. 600–602.) **† VGA**

Outlines the specifications for oils adopted by the V. D. E. with standard tests for determination in regard to sludging, specific gravity, viscosity, flash point, freezing point, acidity, and tar number. Method of delivery and handling.

521. **Vereinigung der Elektrizitätswerke.** Die technischen Bedingungen für Transformatoren- und Schalteröle. (Petroleum, Berlin, Jahrg. 19, 1923, p. 838–849.) **VHYA**

Detailed specifications for physical and chemical requirements and tests for moisture content, specific gravity, flash point, cold point, viscosity, color and dielectric strength.

522. **Weber,** H. C. P. Composition and ageing of insulating varnishes. (American Electrochemical Society, Transactions, New York, v. 44, 1923, p. 53–56; discussion, p. 56.) **PKA**

It is shown that the amount of low resistance materials in insulating varnishes is proportional to the amount of oil in the varnish, and that there is a noticeable difference in the amount produced by different oils.

523. **Wills,** G. M. Observations on operation of power transformers. (Journal of electricity, San Francisco, v. 50, 1923, p. 425–426.) **† VGA**

Experience of a California operating company with centrifugal separator for maintaining the dielectric quality of oil.

524. **Wilson,** W. Apparatus for flash-testing small quantities of oil. (Institution of Electrical Engineers, Journal, London, v. 62, 1923, p. 76.) **† VGA**

1924

525. **American Society for Testing Materials.** Standard method of test for flash and fire points by means of open cup. Serial designation D 92–24. (American Society for Testing Materials, Standards, Philadelphia, 1924, p. 887–891.) **VEE**

526. —— Standard method of test for flash point by means of the Pensky-Martens closed tester. Serial designation D 93–22. (American Society for Testing Materials, Standards, Philadelphia, 1924, p. 892–900.) **VEE**

527. —— Standard method of testing transformer and switch oils. Serial designation D 117–24. (American Society for Testing Materials, Standards, Philadelphia, 1924, p. 1070–1073.) **VEE**

Outlines standardized methods of testing as adopted covering viscosity, flash point, fire point, pour point, acidity, sulphur content, and methods of sampling from transformer and switch tanks, and standard size and type of test cup and electrodes. The importance of a sludging test is recognized but none of the methods generally used are considered as sufficiently satisfactory for standardization.

528. **Bowker,** William R. Dehydration and testing transformer oils and transformers. (Southern engineer, Dalton, v. 41, April, 1924, p. 54–56.) **† VFA**

The chief cause of transformer breakdown is given as the occlusion of moisture. A simple testing device and a gravity filter are described, together with method of use.

529. **Coates,** William Anselm. The choice of switchgear for main- and sub-stations. London: Blackie and Son, Limited, 1924. 292 p. illus. 8°. **VGM**

p. 75–97: "Oil switches and circuit-breakers"; p. 138–140: Oil-filled bushings.

530. **Cole,** Harold. Hot spots and overload indicators. (Electrical world, New York, v. 84, 1924, p. 314–317, 360–362.) **† VGA**

Abstracted in *Science abstracts,* London, v. 24-B, 1924, p. 569, *PAA.*

Results of studies made by the Detroit Edison Company to permit utilizing transformers more effectively without incurring serious overheating, and to determine accuracy, time-lag, correct setting, etc., of overload indicators.

531. **Comitato elettrotecnico italiano.** Norme per la fornitura e il controllo degli oli per transformatori et apparecchi elettrici. (L'Elettrotecnica, Milano, v. 11, 1924, p. 131–135.) **3–VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 275, *PAA.*

The first section deals with the function and properties of oils, the second with methods of testing turbidity, acidity, alkalinity, viscosity, sulphur and resin content, cold point, flash point, dielectric strength, tendency to sludge, and action of oxidation products upon cotton insulation. Sample specifications are given, and recommendations made for testing and maintenance of oil in service.

532. **Condit Electrical Manufacturing Company.** "Standard" semaphores for use on all types of transformers (indoor and outdoor). n.p., 1924. 4 p. 4°. (Condit bulletin. Nov., 1924.) **† VGM n.c.1**

533. **Cox,** D. C. A method for estimating acidity of oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 24, part 1, 1924, p. 659–660.) **VEE**

After treating the sample of oil, the end point of titration is determined by means of electrical measurement.

534. **Dann,** Walter M., and D. R. Kellogg. The inertaire transformer. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 1025–1036; discussion, p. 1036–1038.) **† VGA**

Oxidation is the cause of almost all troubles that develop in service in connection with transformer oil and it is thought by the authors of this paper that the obvious remedy for such troubles is to isolate the oil completely from contact with the air. A new method of providing this complete protection in the inertaire transformer, by the creation of a body of nitrogen over the oil, is described. Short bibliography.

535. **De Laval-Watson** oil testing outfit. (Engineering, London, v. 118, 1924, p. 877.) **† VDA**

536. **Del Mar,** William Arthur. Electric cables, their design, manufacture and use. New York: McGraw-Hill Book Company, Inc., 1924. vii, 208 p. illus. 8°. **VGM**

p. 8: Dielectric strength of oil; p. 84: Breakdown, series insulation; p. 189: Effect of impurities and time lag.

537. **Del Mar,** William Arthur, and C. F. Hanson. High-voltage impregnated paper cables. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 947–954; discussion, p. 954–957.) **† VGA**

The theory is advanced that breakdown of cables is due to surface leakage rather than to the air ionization. Determinations were made of the physical properties of oils covering viscosity, resistivity, dielectric strength, flow point, susceptibility to oxidation, influence of rosin and other substances; and of papers covering dielectric strength when impregnated, tearing strength, folding endurance, air permeability and oil permeability.

538. **DeWeese,** Fred C. Filtering transformer oil in the field. (Power, New York, v. 60, 1924, p. 1016–1017.) **† VFA**

Method of sampling, testing for breakdown voltage, and filtering by the filter press method.

539. **Dieterle,** R. Methoden und Apparate zur Ermittlung der Durchspannung von flüssigen und von vergiessbaren elektrischen Isolierstoffe. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 45, 1924, p. 513–518; discussion, p. 1097.) **† VGA**

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 2110, *PKA; Science abstracts,* London, v. 28-B, 1925, p. 246, *PAA.*

Recommendations are made for improved and standardized methods of testing various materials; for oil the author deals chiefly with the shape, material, spacing and position of the electrodes.

1924, continued.

540. Doherty, R. E., and E. S. Carter. Effect of altitude on temperature rise. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 824–838; discussion, p. 839–843.) † VGA

Heat is dissipated from the surfaces of apparatus principally by convection and radiation. The former is a function both of temperature rise and of air density, that is, of altitude; the latter, of temperature rise only. The energy loss in the apparatus, as dissipated heat is not changed significantly by altitude. Thus lower air density at higher altitude means decreased convection. The purpose of the tests conducted was to correlate these factors so that quantitative calculations can be made for turbine generators; enclosed motors and generators; air, water and oil cooled transformers and auxilliary equipment. Bibliography.

541. Draeger, Kurt. Über die Leitfähigkeit und die dielektrische Festigkeit von Transformatorenöl. (Archiv für Elektrotechnik, Berlin, Bd. 13, 1924, p. 366–391.) VGA

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 45, 1924, p. 727–728, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 510–511, *PAA; L'Elettrotecnica,* Milano, v. 12, 1925, p. 28, *3–VGA.*

Reviews the theory of Günther-Schulze regarding the nature of dielectric breakdown, and advances the theory that ions driven through the liquid warm the adjacent particles of liquid by friction; if the frictional heat be great enough, paths of vapor are thus formed. The investigations described concern the effects of impurities, duration of current flow, and temperature upon the conductivity of transformer oil; the effects of impurities, water, wave-form, and frequency; and the relative dielectric strength under alternating-current and direct-current stress. Bibliography.

542. Dreyfuss, L. Über die Anwendung der Theorie der konformen Abbildung zur Berechnung der Durchschlags- und Überschlagsspannung zwischen kantigen Konstruktionsteilen unter Öl. (Archiv für Elektrotechnik, Berlin, Bd. 13, 1924, p. 123–145.) VGA

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 434, *PAA.*

A study of the relation of breakdown voltage with the distance apart of variously shaped plates. The application of these results to the design of oil-insulated transformers is discussed.

543. Engelhardt, Viktor. Zur Messung der dielektrischen Festigkeit von Isolierölen. (Archiv für Elektrotechnik, Berlin, Bd. 13, 1924, p. 181–186.) VGA

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 42, 1924, p. 610, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 511, *PAA.*

The influence of cleaning and drying the electrodes on the observed dielectric strength is investigated. A specially developed testing set is described, the chief value of which lies in the ease with which it may be cleaned and dried. The oil to be tested is dried by calcium chloride and filtered; the electrodes are cleaned with benzol and dried in an electric furnace. This method, however, is not suited to the determination of the suitability of oil in use or proposed for use, as it is not an indication of the original condition of the oil.

544. Filtering transil oil. (Electrical world, New York, v. 84, 1924, p. 689.) † VGA

Outlines the instructions formulated by the Worcester, Mass., Electric Light Company covering the inspection, repair and testing of transformers and the filtering of insulating oil.

545. Filter press for transformer oil. (Engineering, London, v. 118, 1924, p. 768.) † VDA

Built by Mr. George Lister.

546. Frank, Fritz. Beobachtungen über die Ursachen der Veränderung der Schmier- und Isolieröle im Gebrauch. (Petroleum, Berlin, Jahrg. 20, 1924, p. 1488–1493.) VHYA

Same, condensed, in *Der Praktische Maschinen-Konstrukteur,* Berlin, Jahrg. 57, 1924, p. 579–580, † *VDA.* Abstracted in *Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 6, 1924, p. 2626, *PKA.*

Discusses in a general way the function of oil in transformers, the causes of sludging and acid formation, and methods of maintaining dielectric strength.

547. Garrard, Charles C. Explosion pots. (Electrician, London, v. 92, 1924, p. 766–767.) † VGA

Abstracted in *Electrical world,* New York, v. 84, 1924, p. 326, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 423, *PAA.*

The author advocates the use of explosion pots on breakers on the ground that they cause the gas generated within them to accelerate the expulsion of the contacts, and to direct a stream of oil into the arc and against the contacts. A breaker so equipped has a larger rupturing capacity than would otherwise be the case.

548. Guenther-Schulze, Adolf. Über die dielektrische Festigkeit. München: Josef Kösel und Friedrich Pustet, 1924. 142 p. illus. 8°. VGF p.v.42, no.3

p. 89–102: Liquid dielectrics; p. 131–142: Classified bibliography on insulation.

549. Heinicke, H. Bemerkenswerter Betriebsunfall. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 45, 1924, p. 441–442.) † VGA

Abstracted in *Electrical world,* New York, v. 83, 1924, p. 1342, † *VGA.*

An explosion of an oil switch designed for 6,000-volts and 2,000 amp. is described. Investigation showed that the auxiliary contacts had closed but not the main contacts. The explosion was attributed to the ignition of gases formed by the sustained arc.

550. Heyden, Hans von der, and Kurt Typke. Durchschlagsfestigkeit gebrauchter Transformatorenöle. (Petroleum, Berlin, Jahrg. 20, 1924, p. 1428.) VHYA

Same in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 20, 1924, p. 1428, † *VGA.*

A brief analysis of the chemical and physical characteristics of transformer oils after a considerable period of use.

551. —— Einwirkung verschiedener Seifen auf Transformatorenöl. (Petroleum, Berlin, Jahrg. 20, 1924, p. 857–858.) VHYA

Abstracted in *Chemical abstracts,* Easton, v. 18, 1925, p. 3474, *PKA; Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B624, *VOA.*

After heating samples of transformer oil with lead, iron, copper, sodium, potassium, magnesium, calcium and aluminum oleates and lead, iron and copper stearates the following properties were determined: color, precipitate, viscosity, ash content, acid number, and tar number.

552. —— Einwirkung von Metallen und Metallkombinationen auf Transformator-

1924, continued.

enöl. (Petroleum, Berlin, Jahrg. 20, 1924, p. 320–325.) **VHYA**

See also p. 800–801, 1034–1035.

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 1564, *PKA; Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B364, *VOA.*

"Samples of transformer oils were heated for 70 hours at 120° in the presence of plates of various metals, both with and without use of a current of oxygen. The following properties of the resulting oils were determined: color, precipitate, viscosity, ash, acid number and tar number. Copper alone or in combination with other metals had an unfavorable effect upon the oil, while zinc or aluminum alone or with oxidized copper gave favorable results." — *Chemical abstracts.* loc. cit.

553. —— Erhitzung von Transformatorenöl mit Metallen unter Luftabschluss. (Petroleum, Berlin, Jahrg. 20, 1924, p. 1128–1129.) **VHYA**

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 3474, *PKA; Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B739, *VOA.*

"Transformer oil heated for 70 hours with copper, tin, lead, iron, zinc and aluminum in the presence of excess air showed no change in acid number, or tar number and but slight changes in viscosity." — *Chemical abstracts,* loc. cit.

554. —— Erhitzung von Transformatorenöl mit verschiednen Salzen. (Petroleum, Berlin, Jahrg. 20, 1924, p. 953–955.) **VHYA**

Abstracted in *Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B702, *VOA.*

Color, precipitate, viscosity, ash, acid number and tar number were obtained for a number of salts in oil upon heating; results are given in tabulated form.

555. —— Transformatorenöle. (Zeitschrift für angewandte Chemie, Leipzig, Jahrg. 37, 1924, p. 853–855.) **PKA**

Discusses in a general way the conditions an oil must fulfill in transformers; causes of fouling and disintegration, oxidation, sludging and acid formation. Also mentions the use of an inert air over the oil, and the effects of various salts in solution in the oil.

556. —— Transformatorenöle. (Petroleum, Berlin, Jahrg. 20, 1924, p. 1323–1325.) **VHYA**

A general discussion of the functions of transformer oils; their physical and chemical qualities and requirements, causes of their dielectric breakdown and the formation of acids, sludges and moisture; methods of testing therefor and of recovering dielectric strength.

557. —— Transformatorenöle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 45, 1924, p. 931–935.) **† VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 504, *PAA; Chemical abstracts,* Easton, v. 18, 1924, p. 3474, *PKA.*

Discusses the sludging factor of oils and the factors which contribute to depreciation and disintegration; in this connection it is recommended that the oxygen in the tank be replaced by an inert gas and that where possible copper parts be taped and iron parts varnished, thus helping to immunize the oil from catalytic action. Outlines tests designed to determine the suitability of oil for further use.

558. —— Einwirkung von Metallen und Metallkombinationen auf Transformatorenöl. (Petroleum, Berlin, Jahrg. 20, 1924, p. 1034–1036.) **VHYA**

Supplementary article to that in *Petroleum,* Jahrg. 20, p. 320–325, and reply to article by Stäger and Bohnenblust, *Petroleum,* Jahrg. 20, 1924, p. 800–801.

559. High-pressure testing. The De Laval-Watson transformer set. (Electrician, London, v. 93, 1924, p. 698–699.) **† VGA**

560. Hilliard, J. D. Oil circuit breaker investigation as carried on with a 26,700-kva generator. — Oil and tanks. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 642–645; discussion, p. 655–659.) **† VGA**

Same, condensed, in *General Electric review,* Schenectady, v. 27, 1924, p. 822–829, *VGA.* Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 544–545, *PAA; Electrical world,* New York, v. 84, 1924, p. 752, † *VGA.*

Discusses the relation of oil head, air space above the oil, venting, tank pressure, tank lining, tank support, oxidation of contacts, oil throw, viscosity and other oil characteristics to the breaking capacity of the switch. Discusses the causes of explosions, the results, and methods recommended to prevent them or to minimize their consequences.

561. Hoeg, Fritz. Transformer oils. (Electrical world, New York, v. 84, 1924, p. 1116.) **† VGA**

Abstracted from the *Meddelelser fra Norske Elektricitetsverkers Forening,* October, 1924. Deals with the formation of sludge and other deposits in oil under the influence of an electric field.

562. Jenks, J. S. High-voltage circuit-breakers. The operator's viewpoint — giving experiences and opinions.—Oil. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 652–655; discussion, p. 655–659.) **† VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 42, 1924, p. 499, † *VGA.*

Discusses the function of the oil in quenching the arc; the generation of gas; and the methods suggested to prevent the ignition and subsequent explosion of the gas. Gives qualities an ideal circuit-breaker fluid should possess.

563. Jukes, H. D. The dielectric strength of high-pressure transformer and switch oils. (Electrical review, London, v. 95, 1924, p. 847.) **† VGA**

Comment, v. 96, 1925, p. 288–290, 571–572.

Tabulated results of tests made on samples of large batches of oil purified by a 600 gallon per hour centrifugal machine.

564. Kissling, Richard. Chemische Technologie des erdöls und der ihm nahestehenden Naturerzeugnisse: Erdgas, Erdwachs und Erdpech (Asphalt). Braunschweig: Friedrich Vieweg & Sohn Akt.-Ges., 1924. xviii, 804 p. illus. 8°. **VHY**

p. 621–622: General requirements of transformer oils; p. 670, 702: Review of the literature, and of the work on transformer oils.

565. La Gorce, de. Étude sur les pertes diélectriques des isolants employés dans les machines. (Société française des électriciens, Bulletin, Paris, série 4, tome 4, 1924, p. 314.) **VGH**

Brief outline of tests on oil-immersed transformers; dielectric losses through the oil are negligible.

566. L'Epplattenier, O. Interruttori automatici in olio. (L'Elettrotecnica, Milano, v. 11, 1924, p. 222–229.) **3–VGA**

Abstracted in *Electrical world,* New York, v. 83, 1924, p. 1342, † *VGA.*

A general outline of oil switch practice with special attention given to details of design which

1924, continued.

affect the breaking capacity, as shape of contacts, and the number and speed of breaks. Electrostatic and thermodynamic phenomena are treated at considerable length.

567. Lubowsky, Kurt. Influence exerted by altitude on apparatus. (Electrical world, New York, v. 84, 1924, p. 109–110.) **† VGA**

Correction factors for heating, output and ratings for various types of apparatus for any altitude.

567a. McDowell, Louise S. The power loss in condensers with liquid dielectrics. (Physical review, Corning, N. Y., v. 23, 1924, p. 507–519.) **PAA**

Using a variable test condenser with conical plates nickel-plated, measurements for frequencies below 3700 were made by the bridge method, and for higher frequencies to 1,500,000 cycles by a resonance substitution method. Castor oil, benzene, xylene, toluene, olive oil, paraffine oil, medicinal oil, "Bostonia", glycerine and oil of turpentine were studied. The power loss per unit voltage is approximately constant for benzene, xylene and toluene as the frequency increased from 700 to 3500. This indicates that the loss is due chiefly to conductivity, but in some liquids, notably xylene, there is apparently a small additional loss which decreases with the frequency but which does not fit the equation for dielectric absorption. Castor oil and olive oil show a loss per unit voltage increasing with frequency, suggesting two leaky condensers in series.

568. MacNeill, J. B. High voltage oil circuit breaker tests. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 629–634; discussion, p. 655–660.) **† VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 394, *PAA; Electrical world,* New York, v. 83, 1924, p. 766–767, *† VGA.*

Results of tests are given covering effects of heavy short circuit conditions on tanks, tank lining, oil, etc.

569. Montsinger, V. M. Dielectric strength of insulation. (Electrical world, New York, v. 84, 1924, p. 723–727.) **† VGA**

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 3660, *PKA.*

Determination of the influence of time and frequency on solid and liquid dielectrics singly and in series grouping. Data given in graphic and tabulated form.

570. —— Effects of time and frequency on insulation test of transformers. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 337–347; discussion, p. 354–355.) **VGA**

Abstracted in *Electrical world,* New York, v. 83, 1924, p. 537–538, *† VGA; Science abstracts,* London, v. 27-B, 1924, p. 225, *PAA.*

Above a certain voltage, time of voltage application as well as voltage causes failure of insulation and the dielectric strength can be expressed as a function of both time and voltage. The behaviour of oil without barriers is so erratic that no very definite relation can be obtained between time and dielectric strength. In general time decreases the strength quite rapidly for the first few seconds after which the effect decreases and probably disappears after two or three minutes. The effect of time on the strength of solid insulation and oil in series is about the same for solid insulation alone until the oil insulation exceeds the solid insulation thickness after which it begins to be the same as for oil without barriers. Time and voltage curves are given for most of the tests on samples.

571. —— Recent developments in alternating-current temperature indicators for transformers. (General Electric review, Schenectady, v. 27, 1924, p. 706–707.) **VGA**

572. Montsinger, V. M., and W. H. Cooney. Temperature rise of stationary electrical apparatus as influenced by radiation, convection and altitude. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 814–823; discussion, p. 839–843.) **† VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 31, *PAA.*

A study of the effect of altitude on equipment cooled by convection and radiation. Altitude does not affect the radiation losses, but the convection loss is proportional to the square root of the barometric pressure; based on this, the temperature increases about 4.6% per 1,000 metres increase in altitude, but copper loss increases this figure due to the increase of resistance with increase of temperature. It is concluded that for oil-immersed, self-cooled transformers, with plain tanks and radiator tanks, the corrections for 1,000 metres will be percentage increases in copper losses of 1.75 and 3.0 respectively, and percentage decreases in kva. of 1.35 and 2.3 respectively.

573. National Electric Light Association. — Committee of Prime Movers. Report 1924. — Lubrication. (National Electric Light Association, Proceedings, New York, 1924, p. 1426–1438.) **VGS**

Information is given as to methods of making tests for the oxidation, acidification, emulsification and sludging of turbine oils. Laboratory data is presented in graphic form to show the relation of water to acidification, oxidation and sludge formation, the effect of air and water on oxidation, and the relation of amount of water present to emulsibility. A "sludge accelerator" is described and a comparison is made of the results obtained with this device as against the results obtained in actual practice.

574. Norlin, Evert. Undersökningar över transformatorolior. 1. Metoder för bestämning av transformatoroljors beständighet mot luftoxidation. [Stockholm,] 1925. 46 p. 8°. (Sweden. — Statens Provningsanstalt, Meddelande 25.) **3–VBA (Sweden)**

In this paper a report is given on the investigations made for the purpose of elaborating the chief methods of testing the resistance of transformer oils to oxidation by the air, viz.: methods of testing tar value, asphalt value, formolite value and iodine value. The results obtained with the Kissling and Brauen tar value tests are compared and a standard method devised. The asphalt value (Michie) test was adopted with slight changes.

575. Nuttall, W. H. A new sludging test for transformer oils. (World power, London, v. 2, 1924, p. 92–96.) **VGA**

Abstracted in *Electrical world,* New York, v. 84, 1924, p. 852, *† VGA; Science abstracts,* London, v. 27-B, 1924, p. 506. *PAA; Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B739, *VOA.*

Consists of allowing a definite amount of oil to flow under carefully regulated conditions from a pipette, and counting the drops produced. By this method a measure may be had of the interfacial tension of the oil, and has been found substantially in agreement with the results of other methods for determination of sludging characteristic.

576. Oil purification and testing. (Electrician, London, v. 92, 1924, p. 101–102.) **† VGA**

Describes the Empson centrifugal purifier and the dielectrimiter.

1924, continued.

577. **Orr,** Frank. Testing oil of high voltage transformers on the premises. (Modern mining, Pittsburgh, v. 1, 1924, p. 76–77.) † VHWA

Describes an improvised filter press.

578. **Rice,** Chester W. Free convection of heat in gases and liquids. II. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 131–143; discussion, p. 143–144.) † VGA

A general analysis of the convection of heat from variously shaped bodies by means of different liquids and gases. Results are expressed in curves and in tabulated form. Bibliographical footnotes.

579. **Ruehle.** Über Transformatorenöle. (Petroleum, Berlin, Jahrg. 20, 1924, p. 799.) VHYA

Condensed form of paper published by the Berliner Elektrizitätswerke, dealing particularly with the dielectric strength of oil, and the effects of impurities and of heating.

580. **Schering,** Harald, editor. Die Isolierstoffe der Elektrotechnik. Vortragsreihe, veranstaltet von dem Elektrotechnischen Verein E. V. und der Technischen Hochschule, Berlin. Berlin: Julius Springer, 1924. 392 p. illus. 8°. VGM

p. 337–359: "Das Mineralöl. Sein Vorkommen, seine Gewinnung, Verarbeitung und Verwendung unter besonderer Berücksichtigung der elektrischen Industrie. Von F. Frank."

p. 350: "Schalter- und Transformatorenöle; p. 355: "Technische Bedingungen für in Kesselwagen oder eisernen Fässern angelieferte Mineralerdöle für Transformatoren und Schalter;" p. 355–359: "Untersuchungsmethoden für Transformatoren-, Schalter- und Dampfturbinenöle."

581. **Schwartz,** F., and J. Marcusson. Zur Bestimmung der Verteerungszahl. (Petroleum, Berlin, Bd. 20, 1924, p. 776–777.) VHYA

Abstracted in *Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B586, *VOA.*

Recommends the use of petroleum spirit for extraction of sludge.

582. **Seymour,** Hartland. Insulating oils. Some factors to be observed in handling. (Electrician, London, v. 92, 1924, p. 427.) † VGA

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 1564, *PKA.*

Methods of shipping, storing, and maintaining.

583. **Sieber,** F. Zulässige Überlastungen von ölgekühlten Transformatoren. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 45, 1924, p. 769–771.) † VGA

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 518, *PAA.*

A study of the effects and of the permissible heating effects due to overloads. The final temperature of the oil must be lower than with normal load as the temperature difference between the windings and oil is proportional to the copper loss. Results of observations shown graphically.

584. **Sligh,** T. S., jr. An oxidation method for measuring the stability of mineral oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 24, part 2, 1924, p. 964–972; discussion, p. 973–974.) VEE

The oxidation methods proposed in this paper for obtaining knowledge of the sludging characteristics of oils are intended as standardized tests which may be applied to laboratory investigations. The tests consist essentially in distinguishing between various classes of oxidation products and a sludging number is assigned, depending upon the amounts and proportions of products formed.

585. **Snyder,** E. A. Dielectric strength of insulating materials. Liquid insulation. (American Society for Testing Materials, Proceedings, Philadelphia, v. 24, part 1, 1924, p. 643–650.) VEE

Recommends the adoption of standardized circular disk electrodes for testing liquids and solid materials in the form of sheets and plates in oil; discusses relations of dielectric strength with electrode size, rate of increase of test voltage, time, temperature, and wave form.

586. —— Life test for transformer oils. (American Society for Testing Materials, Proceedings, Philadelphia, v. 24, part 1, 1924, p. 638–641.) VEE

An improved method for determination of sludging character. Revision of method in entry no. 508; consists in maintaining samples of oil at 120° C. until sludge is formed which is settled out by centrifugal motion.

587. —— Sludging tests for transformer oils: a criticism of various test methods and a proposed new method of test. (American Society for Testing Materials, Proceedings, Philadelphia, v. 24, part 2, 1924, p. 954–963; discussion, p. 973–974.) VEE

States that very often causes of sludging are explained without data to substantiate the theory, and offers results of tests which show conclusively that sludging is purely an oxidation process and may go on independent of metallic or other catalysts. Criticizes the Michie test on the ground that it is not a true indication of sludging character due to the use of copper which acts as a catalyst. The value of the formolite test assumes that unsaturated hydrocarbons form the basis of sludge; tests do not support this assumption. The German Nine test is criticized as it assumes that sludge formation is always acid in character which has been shown to be untrue. The iodine test is a measure of the unsaturated olefines only. The Brown Boveri test is an indication of sludge formed during a predetermined period, and so is not an indication of the sludging property, but of the ability of the oil to resist action for a comparatively brief time.

The A.S.T.M. life test is discussed as a means of overcoming the objections held against the other methods.

588. **Some** important features of transformer oils. (Mechanical world, Manchester, Eng., v. 76, 1924, p. 188–189.) VFA

Points out the necessity for determining sludging characteristic, affinity for water, and viscosity before purchasing transformer oils.

589. **Sorge,** Joachim. Über die elektrische Festigkeit einiger flüssiger Dielektrika. (Archiv für Elektrotechnik, Berlin, Bd. 13, 1924, p. 189–212.) VGA

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 503–504, *PAA.*

An investigation of the influence on breakdown of the following factors: rate of increase of applied

1924, continued.

voltage of from 100 to 1300-volts per second, and instantaneous application did not affect breakdown field strength. Flat, spherical and pointed electrodes did not affect breakdown field strength within the range tested. Actual value of breakdown field strength increases as the radius of curvature of the electrode decreases. Strength of xylol and hexane decreases with rising temperature. The electric strength of xylol and hexane increases with pressure. Materials of the electrodes affected the breakdown field strength; silver and zinc were high, iron and brass low. Breakdown strength of hexane increases with rising frequency.

590. **Staeger,** Hans, and J. P. Bohnenblust. Einwirkung von Metallen und Metallkombinationen auf Transformatorenöl. (Petroleum, Berlin, Jahrg. 20, 1924, p. 800–801.) **VHYA**

Abstracted in *Society of Chemical Industry, Journal,* London, v. 43, 1924, p. 898B, *VOA.*

Cites the article by Hyden and Typke (*Petroleum,* Berlin, Jahrg. 20, 1924, p. 320–325) and other literature on subject. Give results of experiments conducted on aluminum, tin, nickel, zinc and iron. See also bibliographical footnotes and p. 1034–1036.

591. **Staeger,** Hans. Fortschritte in der Reinigung von Isolierölen. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, Jahrg. 15, 1924, p. 377–384.) **VGA**

Abstracted in *Electrical world,* New York, v. 84, 1924, p. 904, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 506, *PAA.*

Compares the effectiveness of the filter press and the centrifugal machine for purifying oil. The latter method is condemned on the ground that centrifugal force will not separate the water particles of less than a certain critical size, but the smaller particles are the ones most detrimental to oil. In addition, the necessity for heating the oil when using the centrifugal method makes the oil more hygroscopic. Claims that acids are removed by centrifuging are unsubstantiated, and is demonstrated by an analysis of the oil before and after centrifugal treatment.

592. —— Über den katalytischen Einfluss von Metallen auf Mineralöle. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, Jahrg. 15, 1924, p. 93–106.) **VGA**

Abstracted in *Electrical world,* New York, v. 83, 1924, p. 1016, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 464, *PAA; Chemical abstracts,* Easton, v. 19, 1925, p. 724, *PKA.*

Bare copper, brass, tin and zinc accelerate sludging of oil considerably. The action depends upon the proportion between the surface of the submerged metal and the volume of oil except in the case of aluminum, tin, nickel, and iron, with which metals the oxidation at the zone of immersion is of importance. Lead, copper and zinc are eaten away by the generated asphaltogenous acids. The presence of lead liberates a highly oxidizing product of resinous character. The data are given in curves, tabulations and microphotographs.

593. **Stauffacher,** E. R. Transformer cooling. (Journal of electricity, San Francisco, v. 52, 1924, p. 451–455.) **† VGA**

Discusses the effectiveness of oil cooling as affected by circulation, velocity, type of radiator, color of tanks and radiators, heat of the sun, etc.

594. **Still,** Alfred. Elements of electrical design. New York: McGraw-Hill Book Company, 1924. xiii, 528 p. illus. 8°. **VGI**

p. 169: Oil.

595. **Sylvester,** C. Switch and transformer oil. (Electrical review, London, v. 95, 1924, p. 73.) **† VGA**

The necessity of inspection and testing for determination of moisture, deposit, and loss of dielectric strength.

596. **Tesche,** O. Über die Bestimmung der Wärmeleitfähigkeit technischer Materialien. (Zeitschrift für technische Physik, Leipzig, Jahrg. 5, 1924, p. 233–236.) **PAA**

Abstracted in *Chemical abstracts,* Easton, v. 18, 1924, p. 3134, *PKA.*

Methods and apparatus for measuring thermal conductivities; tabulated results are given for several materials, including transformer oil.

597. **Tobler,** F. Die Behandlung des Isolieröles vor dem Einfüllen in Schalter und Transformatoren und die periodische Revision von Schalter- und Transformatorenöl im Betriebe. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, v. 15, 1924, p. 373–376.) **† VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 505, *PAA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 46, 1925, p. 25, † *VGA.*

Differentiates the requirements of oil for indoor and outdoor equipment. Problem of disintegration of the oil by heat, resulting in sludge and acids. Flash-point and specific gravity are relatively unimportant. Advocates the use of the filter press in preference to centrifugal machines, tests having shown that microscopic and colloidal impurities are not removed by the latter type.

598. **Transformer** inspections. (Electrical world, New York, v. 84, 1924, p. 412–414.) **† VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 569, *PAA.*

Outlines the method adopted by the People's Light Company of Davenport, Iowa, for the maintenance of distribution transformers, especially the oil.

599. **Transformer** oil-testing equipments. (World power, London, v. 1, 1924, p. 249–251.) **VGA**

Describes a Johnson & Phillips testing transformer with a range of voltage on the high side of from 0 to 40,000.

600. **Vidmar,** Milan. Trockentransformator und Öltransformator. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 42, 1924, p. 78–82.) **† VGA**

Abstracted in *Electrical world,* New York, v. 83, 1924, p. 734, † *VGA; Science abstracts,* London, v. 27-B, 1924, p. 296, *PAA.*

The author concludes that for ratings not exceeding 150 kva. and potentials not exceeding 10,000-volts, air-cooled transformers are cheaper and more efficient than the oil type. Greater safety from puncture may be expected due to the more consistent dielectric strength of air. The only advantage of the oil type is its greater overload capacity.

601. **Vogel,** Fred. J. Insulation tests of transformers as influenced by time and frequency. (American Institute of Electrical Engineers, Transactions, New York, v. 43, 1924, p. 348–354; discussion, p. 354–355.) **† VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 475, *PAA.*

Measurements of breakdown voltages for various series combinations are plotted against time and frequency. Frequency of the applied voltage is shown to affect the breakdown voltage of solid insulation, but only slightly to affect the creepage failure.

1924, continued.

602. **Weber,** H. C. P., and R. H. Wynne. Halogenated hydrocarbons as dielectrics. Effect on flash and fire point of transformer oils. (American Electrochemical Society, Transactions, New York, v. 46, 1924, p. 197–203; discussion, p. 203–204.) **PKA**

Abstracted in *Electrical world,* New York, v. 84, 1924, p. 960, † *VGA; Chemical abstracts,* Easton, v. 18, 1924, p. 3324, *PKA; Society of Chemical Industry, Journal,* London, v. 43, 1924, p. B915, *VOA; Chemisches Zentralblatt,* Berlin, Folge 6, Jahrg. 6, Bd. 2, 1924, p. 2626, *PKA.*

In order to determine what regularities, if any, existed in the effect of halogenated hydrocarbons upon combustible oils, a study was made of the change in flash and fire points produced by varying the percentages of a series compound. The oils were two transformer oils designated, respectively, "Lactroseal" and "Hi-Flash" oils.

603. **Wenger,** J. Fortschritte in der Reinigung von Isolierölen. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, v. 15, 1924, p. 293–298.) **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 465, *PAA.*

Compares the advantages and disadvantages of purifying oil by methods of heating, vacuum, filter press, gravity filter and by centrifugal machine. The last mentioned method is given preference and a recently developed machine described which operates at a comparatively low speed, and which has given satisfactory results as shown by samples purified and tested.

604. **Zipp,** H. Aus der Praxis des Transformatorenbetriebs. (Elektrische Betrieb, München, Jahrg. 22, 1924, p. 172–174.) **VGA**

Abstracted in *Science abstracts,* London, v. 27-B, 1924, p. 172–174, *PAA.*

Points out that moisture may prove harmful to transformers due to the formation of rust on portions above the oil which subsequently scales and may enter the oil and the windings. A thermally operated overload switch is described which is actuated by the release of a spring normally held in compression by a fusible metal.

1925

605. **Andry-Bourgeois.** Déshydratation et filtrage des huiles de transformateurs. (L'Électricien, Paris, tome 56, 1925, p. 361–364.) **† VGA**

Describes several methods of maintaining oil by continuous filtration and cooling.

606. **Anklam.** Bekämpfung von Bränden in elektrischen Anlagen und in deren Nähe. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1508–1509.) **VGA**

Discusses various methods of fighting oil fires in stations. Advocates the use of carbon tetrachloride.

607. **Beck.** Hochleistungs-Ölschalter mit Gaskammern. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 43, 1925, p. 585–586.) **† VGA**

Abstracted from *Bulletin Oerlikon,* Nov., 1924.

608. **Bell,** G. E., and F. Y. Poynton. Dielectric constants. (Philosophical magazine, London, series 7, v. 49, 1925, p. 1065–1072.) **OA**

Abstracted in *Science abstracts,* London, v. 28-A, 1925, p. 637, *PAA.*

"Application of valve-maintained circuits to the measurement of the dielectric constant of castor oil, olive oil and linseed oil, with special reference to its variation with the temperature. A linear relation is found to hold in each case."

609. **Boller,** W. Fortschritte in der Reinigung von Isolierölen. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, Jahrg. 16, 1925, p. 179–184.) **† VGA**

Abstracted in *Electrical world,* New York, v. 85, 1925, p. 1357, *VGA.*

Compares the relative efficiencies of purifying oils by means of filter press and the centrifuge. Discounts the claims of others that the inability of the latter method to remove minute portions of moisture is of importance. Both methods are found suitable for all practical purposes.

610. **British Thomson-Houston Company, Limited.** Instrument potential transformers for line voltages exceeding 33,000-volts. [Rugby, England,] 1925. 22 p. 8°. (Instruction book no. 1288.) **† VGM n.c.1, no.1**

p. 8–13: "Transformer oil." Shipping, sampling, testing and drying of oil; filling of transformer.

611. **Calcium** chloride breathers for transformers. (Engineering, London, v. 118, 1924, p. 802.) **† VDA**

Abstracted in *Electrical world,* New York, v. 85, 1925, p. 212, *VGA.*

612. **Carriage** for oil filter press proves labor saver. (Journal of electricity, San Francisco, v. 55, 1925, p. 58–59.) **† VGA**

Describes a carriage built by the Pacific Gas and Electric Company on which a standard filter press was installed for station use.

613. The **Centrifugal** purification of oils. (World power, London, v. 3, 1925, p. 60–62.) **VGA**

Describes the De Laval centrifuge and its application to the maintenance of turbine and transformer oils in power stations.

614. **Christie,** Clarence V. Electrical engineering. Theory and characteristics of electrical circuits and machinery. New York: McGraw-Hill Book Co., 1925. viii, 613 p. illus. 8°. **VGC**

p. 420–422: Methods of cooling transformers.

615. **Clark,** F. M., and V. M. Montsinger. Dielectric-strength-thickness relation in fibrous insulation. (General Electric review, Schenectady, v. 28, 1925, p. 286–290.) **VGA**

Abstracted in *Electrical world,* v. 86, 1925, p. 129, *VGA.*

Includes a study of the effect of oil immersion and oil-impregnation on the dielectric strength of varnished cloth, Kraft paper, linen paper, pressboard and mica.

616. **Clark,** Lee Hinchman. The purification of circuit-breaker oil. (Electrical world, New York, v. 86, 1925, p. 562–565.) **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 596, *PAA.*

Describes an oil purifying system consisting of tanks, pump, centrifugal separator, etc., the purification being assisted by reagents. The cost of reconditioning oil is given as 3% of the cost of new oil.

1925, continued.

616a. Coolidge, W. D. Oil-immersed X-ray generating outfits and their uses. (General Electric review, Schenectady, v. 28, 1925, p. 182–192.) **VGA**

Describes a standardized outfit developed by the General Electric Company to meet the need for a portable and easily and safely manipulated set for dental use. The tube operates in oil at 56,000-volts.

617. Cooney, W. H. Predetermination of self-cooled oil-immersed transformer temperatures before conditions are constant. (American Institute of Electrical Engineers, Journal, New York, v. 44, 1925, p. 1324–1331.) **VGA**

A method is explained in detail for calculating B, where 1/B is the thermal time constant, or the time required to attain 63.2% of the final change in temperature rise, for either the top oil rise or the winding rise above the oil from the weight of materials, the iron and copper losses and the winding and top oil constant temperature rises at any given load. Comparison of temperatures by test and calculation are presented.

618. Crago, A. C., and J. K. Hodnette. Corona in oil. (American Institute of Electrical Engineers, Journal, New York, v. 44, 1925, p. 219–222.) **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 251, *PAA; Elektrotechnische Zeitschrift,* Berlin, Jahrg. 46, 1925, p. 1490, † *VGA.*

The action of transformer oil under local high voltage stress is studied by measurement of resistivity during and after the application of test voltage. Voltage higher than that producing visible corona resulted in greatly reduced resistivity; resistivity increased with rest after application of test voltage.

619. Dalzell, D. R. Handling transil oil. (Electrical world, New York, v. 86, 1925, p. 854–855.) **VGA**

Discusses routine of storing, handling, sampling, and testing.

620. Dannatt, C. Dielectric loss measurements on commercial insulating materials. (World power, London, v. 4, 1925, p. 141–146.) **VGA**

Abstracted in *Electrical world,* New York, v. 86, 1925, p. 861, *VGA.*

"The design, calibration, and performance of an oil-immersed electrostatic wattmeter are described."

621. Davey, Wheeler P., and Thomas A. Wilson. A study of liquid dielectrics. Part I. (General Electric review, Schenectady, v. 28, 1925, p. 770–781.) **VGA**

Abstracted in *Electrical world,* New York, v. 86, 1925, p. 1217, *VGA.*

After a general consideration of the theories of dielectric breakdown, and of the dielectric properties of oils, the authors describe a laboratory method for determining the direct-current leak of condensers. Linseed oil was used as dielectric, the following conditions as affecting the effective resistance and the direct-current leak were studied: presence of moisture and air in the liquid dielectric, leakages tabulated in micro-amp and resistance in megohms; absorption by the spacer of linseed oil; condensers with air bubbles and moisture ironed out as compared to condensers not so treated; removal of air alone from dielectric; and the effect of extreme removal of colloidally dissolved air, moisture and volatile oxidation products.

622. Eby, Eugene D. Oil-filled terminals for high-voltage cables. (American Institute of Electrical Engineers, Journal, New York, v. 44, 1925, p. 593–600.) **VGA**

Abstracted in *Science abstracts,* London, v. 28, 1925, p. 482, *PAA.*

Discusses the design and testing of oil-filled and petrolatum-filled terminals.

623. Estorff, Walter. Die Behandlung der Isolieröle im Betriebe. (Sterkstroom, Hague, jaarg. 3, 1925, p. 133–137.) **† VGA**

624. Fachini-Somazzi. Osservazioni sul metodo italiano per l'analisi degli olii per transformatori. (L'Elettrotecnica, Milano, v. 12, 1925, p. 761–765.) **3–VGA**

Data on sludge formation and increase in acidity of Russian oils to serve as a basis for standard testing.

625. Fernie, F. Dielectrics and electrons. (Electrician, London, v. 94, 1925, p. 484–485.) **† VGA**

A study of the motion of electrons as related to the mechanism of breakdown of solid and liquid dielectrics.

626. Fischer, Albert. Der Alfa-Laval-Ölreinigungs-Separator. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 45, 1925, p. 95–97.) **VGA**

Describes the machine and its method of operation. Tabulated results are given of the dielectric strength of samples of oil before and after treatment.

627. —— Die Reinigung von Transformatoren- und Schalteröl. (Elektrische Betrieb, München, Jahrg. 23, 1925, p. 2–4.) **† VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 192, *PAA.*

Describes the centrifugal type separator and gives results of tests to show its superiority over the filter press.

628. Flowers, Alan E., and others. Deterioration and reclamation of used automobile crank-case oil. (Industrial and engineering chemistry, Easton, v. 17, 1925, p. 481–485.) **† VOA**

A method and apparatus for reclaiming used oils are described and the characteristics of the recovered oils are compared with those of new oils. Bibliography appended.

629. Fokes, L. Preventing sludging of transformer oils. (Electrical world, New York, v. 85, 1925, p. 105.) **† VGA**

Abstracted in *Elektrotechnische Zeitschrift,* Berlin, Jahrg. 46, 1925, p. 391, † *VGA.*

Describes method of fitting expansion tank to transformer case in order to overcome oxidation and subsequent sludging.

630. Fortschritte im Bau von Ölreinigungsseparatoren. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1415.) **† VGA**

Describes the Alfa-Laval centrifugal machine.

631. Harvey, Dean. Insulating oils for oil circuit-breakers. (Electric journal, Pittsburgh, v. 21, 1924, p. 573–578.) **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 191–192, *PAA; Electrical world,* New York,

1925, continued.

v. 84, 1924, p. 1370, † *VGA; Power plant engineering,* Chicago, v. 29, 1925, p. 291–293, † *VDA.*

Discusses the function and action of oil in circuit-breakers, manufacture, shipment, handling, testing and maintenance. Water and carbon in oil have an affinity for each other, and remain in suspension; with the water removed the carbon falls to the bottom. The centrifugal machine used alone is not recommended on the ground that it does not remove carbon, but when used in combination with a filter press, both moisture and carbon are effectively and economically removed.

632. **Hentschel,** Ludwig. Über das dielektrische Verhalten ölgetrankter Papiere. (Archiv für Elektrotechnik, Berlin, Bd. 15, 1925, p. 138–173.) **† VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p.591, *PAA.*

Two thicknesses of paper and various numbers of layers were investigated when impregnated with Russian transformer oil, vaseline oil, American transformer oil, and paraffin oil. Measurements made cover dielectric angle of loss as affected by temperature field strength, etc.; dielectric constant; breakdown voltage for alternating-current; time current curve for the dielectric when charged by a constant direct-current. Bibliography.

633. **Heyden,** Hans von der, and Kurt Typke. Die Behandlung mit Fullererde, eine einfache Methode zur Reinigung gebrauchter Öle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1518–1520.) **VGA**

Abstracted in *Electrical world,* New York, v. 86, 1925, p. 1063, † *VGA.*

On the basis of economy it is recommended that fuller's earth be used to purify insulating oils; it is pointed out, however, that this method is applicable only to oils which have become not too strongly acid, experience having indicated that this limit of acidity is approximately six-tenths.

634. —— Raffinationsversuche auf Verteerungszahl an einem amerikanischen Spindelöldestillat. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1734–1811.) **VGA**

Considers the relation between the tar number of oils and the method of refining, giving in tabulated form the characteristics of oils refined by the use of fuller's earth, sulphuric acid and potassium hydroxide methods.

635. —— Über die Notwendigkeit einer Verschärfung der Prüfbedingungen für Transformatoren-, Schalter- und Turbinenöle. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1264–1265.) **VGA**

Discusses the Brown Boveri sludge test.

636. —— Über Teerzahl und Verteerungszahl. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 737.) **VGA**

637. —— Die Verteerungszahl von Transformatorenölen. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 889–893.) **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 480–481, *PAA; Electrical world,* New York, v. 86, 1925, p. 808, † *VGA.*

The authors discuss the chemical structure of insulating oil in respect to its stability under operating conditions. A comparison is made of the methods and results of various sludge tests and a revised method is presented. A comparison is made of the physical and chemical properties of representative samples of Russian and American oils.

638. **Kapp,** Gisbert. Transformers for single and multiphase currents; a treatise on their theory, construction and use. Revised by Reginald O. Kapp. New York: Isaac Pitman & Sons, 1925. xi, 391 p. illus. 8°. **VGI**

p. 53–57: "Heating of transformers"; p. 57–65: "Circulation of cooling medium;" p. 65–69: Theory of heating and cooling: p. 194–197: "Insulation", describes types used, interaction with and dissolution in oil; p. 201–206: "Terminal connections", "Insulated bushings"; p. 207: "Tanks and fittings"; p. 210: "Oil": physical and chemical properties necessary; British standard specifications; p. 213: "Drying out transformers;" p. 243–248: "Oil": testing and purifying.

639. **Kempe,** H. R. The engineers yearbook of formulæ, rules, tables, data, and memoranda for 1925. London: Crosby, Lockwood and Son, 1925. lxxxviii, 3003 p. illus. 8°. **Desk – 121**

p. 2206–2207: Switch and transformer oil.

640. **Lapiné,** M. Comparison entre les différents genres de cuves pour gros transformateurs à refroidissement naturel. (Revue générale de l'électricité, Paris, tome 17, 1925, p. 373–380.) **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 309–310, *PAA.*

Compares the radiating properties of three natural oil-cooled tanks, namely corrugated tanks, tanks with cooling tubes, and tanks with radiators.

641. **Lee,** A. G., and A. J. Gill. The Leafield coupled arc. — Primary condenser. (Institution of Electrical Engineers, Transactions, London, v. 63, 1925, p. 698–700.) **VGA**

Experiments were carried out to determine the suitability of commercial transformer oils as a dielectric medium at high frequencies, and whether the power factor was affected by the method of treatment.

642. **Linn,** Max. Oil maintenance methods. (Electrical world, New York, v. 85, 1925, p. 819–821.) **VGA**

Trouble has been experienced by the Duquesne Light Company due to the entrance of moisture into tanks by leakage which subsequently froze and to the formation of sludge in breakers due to the high temperatures caused by overload conditions. The author describes the means taken to remedy these conditions and the methods of maintenance adopted.

643. **Marbury,** R. E., and E. R. Le Ghait. Dielectric absorption in fibrous insulating materials. (Electric journal, Pittsburgh, v. 22, 1925, p. 526–534, 605–610.) **VGA**

Abstracted in *Electrical world,* New York, v. 86, 1925, p. 1266, *VGA.*

The first portion of this article describes a dielectric lag meter and its method of operation; in the second portion, the results are given of investigations carried on with this device to determine the residual curves for oil-impregnated insulating materials and the effect of duration of charge and of the presence of moisture.

644. **Matthis,** Alfred R. Les huiles pour transformateurs et interrupteurs. (Société belge des électriciens, Bulletin, Bruxelles,

1925, continued.

tome 38, 1924, p. 357–374; tome 39, 1925, p. 1–25, 37–55, 76–99, 119–146, 191–210, 235–254, 271–287.) 3 – VGA

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 426, *PAA.*

Treats of the formation of sludge and the importance of flash point, viscosity, loss of weight by evaporation, density, freezing point and humidity in relation to dielectric value. Divides oils into three classes according to atmospheric temperature (1) above 80° C.; (2) below 75° C.; (3) where exposed to frost. Compares specifications employed in Sweden, Italy, America, Holland, Germany, Belgium, and other countries. The form, dimensions and distance apart of the electrodes, voltage, etc., in testing and conditions present at commencement of arcing are discussed. Comparison of methods of purification is given.

645. **Moeller,** Ernst. Über die Abhängigkeit des dielektrischen Verlustwinkels und der Dielektrizitätskonstanten von der Frequenz bei Paraffin, Hexan, Xylol, Quartz, Glas, Porzellan, Hartpapieren, Pressspan, und einem ionisierten Luftkondensator. (Archiv für Elektrotechnik, Berlin, Bd. 15, 1925, p. 16–40.) † VGA

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 591–592, *PAA.*

A substitution method is used in which the condenser is measured against an air condenser with a resistance in series to balance the losses in the two circuits. Frequencies of from 500,000 to 12,100,000 are obtained by the use of a toned vacuum tube.

646. **Morrell,** Robert Selby, and H. R. Wood. The chemistry of drying oils. New York: D. Van Nostrand Company, 1925. xi, 224 p. illus. 8°. VON

p. 176–182: "Drying oils as electrical insulators."

647. **Mueller,** J. F. Fortschritte aus dem Transformatorenbau. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 43, 1925, p. 457–465.) † VGA

After dealing with the construction of transformers, the author considers the requirements of oils, special attention being given to the problem of heating, and a device for indicating the temperature of the oil is described.

648. **National Electric Light Association.** — Electrical Apparatus Committee. Report, 1925. Transformers. (National Electric Light Association, Proceedings, New York, 1925, p. 837–839.) VGS

Abstracted in *Electrical review,* London, v. 97, 1925, p. 65, † *VGA; Power,* New York, v. 61, 1925, p. 994, † *VFA.*

Discusses reports of operating companies in regard to the congealing and the sludging of oil in service.

649. **Nedder.** Ölsynthese und Elektrizitätswirtschaft. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1397.) VGA

650. **Nicholson,** A. H. Oil-purification plant on wheels. (Electrical world, New York, v. 86, 1925, p. 567.) VGA

Describes a centrifugal machine and testing outfit conveniently arranged in a truck body by which the Cleveland Electric Illuminating Company maintains the oil in 346 transformers at 19 substations. Economy is gained by reducing the loss of oil during transference which formerly amounted to 150 gal. per thousand and has been reduced to 1 gal. per thousand.

651. **Oelschlaeger,** R. Mikroskopische Beobachtung von Öldurchschlägen. (Siemens Zeitschrift, Berlin, Jahrg. 5, 1925, p. 29–33.) VGA

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 43, 1925, p. 384, † *VGA; Electrical world,* New York, v. 85, 1925, p. 572–573, *VGA.*

A miniature testing gap was devised to be studied under a magnification of fifty to one hundred diameters. Even the best filtered of oils were found to contain impurities of foreign particles in the shape of fine fibers and that these particles were drawn into the gap. The action of the particles under stresses at various voltages of alternating-current and direct-current were recorded by a motion-picture camera.

652. **Peabody,** R. M. Transformer cooling system. (Electrical world, New York, v. 86, 1925, p. 70–71.) VGA

Describes a cooling system developed by the Southern California Edison Company for cooling the oil of transformer banks by passing through auto type radiators cooled by a forced current of air.

653. **Portable** oil filter for substation use. (Electrical world, New York, v. 86, 1925, p. 222.) VGA

Developed by the Pacific Gas and Electric Co.

654. **Reed,** Emerson G. Distribution transformers. (Electric journal, Pittsburgh, v. 22, 1925, p. 295–299.) VGA

Describes a valve for regulating the flow of the cooling water, its action being dependent upon the oil temperature.

655. **Reed,** Emerson G., and W. A. Sumner. Loading transformers on a temperature basis. (Electric journal, Pittsburgh, v. 22, 1925, p. 551–553.) VGA

Abstracted in *Electrician,* London, v. 95, 1925, p. 739, † *VGA.*

A study of the temperature gradient between the oil and the hottest part of the winding, and of the change in the gradient as the load varies.

656. **Reiner,** St. Eine neue Wasserbestimmungsmethode in Mineralölen. (Elektrotechnische Zeitschrift, Berlin, Jahrg. 46, 1925, p. 1447–1448.) † VGA

657. **Rodman,** C. J. Switch oil requirements and characteristics. (Electric journal, Pittsburgh, v. 22, 1925, p. 216–219.) VGA

Outlines the requisites, and discusses the effect on dielectric strength of moisture and decomposition products of the oil by arc. The effect of various percentages of carbon and small particles of copper on the dielectric strength of samples of oil is given in tabulated form.

658. **Rodman,** C. J., and A. H. Maude. Effects of gases in transformer oils. (American Electrochemical Society, Transactions, New York, v. 47, 1925, p. 71–92.) PKA

Abstracted in *Electrical world,* New York, v. 85, 1925, p. 1274, *VGA; Chemical abstracts,* Easton, v. 19, 1925, p. 1943–1944, *PKA; Electrician,* London, v. 95, 1925, p. 729, † *VGA.*

A study of the effect of gas on the life of insulating oils is given showing that oxidation through the agency of oxygen causes most trouble in insulating oil practice, while reducing or inert gases have a continued preservative effect. Methods for determining the solubility of gases in oils and of analyzing the composition of gases dissolved in oils are given. Bibliographical footnotes.

1925, continued.

659. **Roval,** P. Le traitement des huiles de transformateurs. (L'Électricien, Paris, tome 56, 1925, p. 515–517.) † **VGA**

After discussing the effects of moisture, solid particles and heating on the dielectric strength of oil, the author compares three methods of purification: heating, filtering, and centrifuging; a recently developed centrifugal machine is described and its superiority over the other two methods is shown.

660. **Salathe,** Albert. Examination of a turbine oil sludge. (Industrial and engineering chemistry, Easton, v. 17, 1925, p. 414–416.) † **VOA**

Sludge is ascribed to oxidation. Determinations were made of a sample for metals, salts, acids and acetaldehyde. Detailed method of analyses is given.

661. **Sayce,** Leonard Alfred, and H. V. Briscoe. A method of measuring the dielectric constants of liquids. (Chemical Society of London, Journal, London, v. 127, 1925, p. 315–322.) **PKA**

Abstracted in *Science abstracts,* London, v. 28-A, 1925, p. 486–487, *PAA.*

Method described and results given for benzene.

662. **Schweitzer and Conrad, Inc.** The "S & C" extra high potential fuse. [Chicago?] 1925. 16 p. 4°. (Schweitzer and Conrad. Bulletin no. 200.) † **VGM n.c.2**

Describes the construction and operation. Oscillograms compare its operation with that of a standard oil circuit-breaker.

663. **Séchage** et essais des huiles de transformateurs. (L'Électricien, Paris, tome 56, 1925, p. 165.) † **VGA**

Brief specifications covering the usual physical and chemical properties.

664. **Shrader,** J. E. The effect of moisture and temperature on the power factor of transformer oil. (Franklin Institute, Journal, Philadelphia, v. 199, 1925, 513–539.) **VA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 337, *PAA.*

Measurements of watts loss and power factor for three kinds of oil, dry and with predetermined amounts of moisture were made over a range of voltage at 60 cycles, and the results plotted. Variation of p.f. with temperature is also considered.

665. **Shurgar,** W. G. Hastening oil filtering. (Electrical world, New York, v. 86, 1925, p. 802–803.) **VGA**

Arkansas Central Power Co. advocates the use of two blotters instead of five for the first filtering; after removal they are replaced by the normal number.

666. **Staeger,** Hans. Huiles minérales pour transformateurs et interrupteurs. Conditions de livraison et spécifications techniques exigées en Suisse. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, Jahrg. 16, 1925, p. 188–214.) † **VGA**

Abstracted in *Science abstracts,* London, v. 28-B, 1925, p. 426, *PAA.*

The origin and characteristics of the commercial oils, and the tests applied to them in different countries are first considered. A colored plate shows the effects of heating various samples of oils, the color serving as an indication of the quality. The behaviour and requirements of oils for transformers and switches are considered separately, procedure of tests explained in detail and the necessary apparatus is illustrated. Tests cover clarity, viscosity, flash point, dielectric strength, acidity, effect on cotton, formation of sludge, and method of shipping.

667. —— Indice de goudronnification et spécifications des huiles utilisées pour les transformateurs et les turbines à vapeur. (Brown, Boveri Cie. Revue, Baden, année 12, 1925, p. 131–135, 150–153.) **VGA**

This article seeks to show that the tar figure is not a suitable basis for the comparison of transformer oils since it takes into account only the acidity of oil under given conditions and does not indicate the various reaction products resulting from the decomposition of the oil. Bibliographical footnotes.

668. —— Methods of testing transformer oils. (Industrial and engineering chemistry, Easton, v. 17, 1925, p. 1272–1275.) † **VOA**

After a brief outline of the chemical constitution of oils, the effects are considered of heating and catalytic action in the presence of copper, brass, tin, zinc, lead, rheotan and constantan. The German test method (Kissling test), the Michie test, and the American "Life test" are critically reviewed and compared with the Brown, Boveri test (Union des syndicats de l'électricité test) and experimental data are offered to show the superiority of the last mentioned as being more truly representative of operating conditions.

669. **Stigant,** S. Austen, and H. Morgan Lacey. The J. & P. transformer book, being a practical technology of the power transformer. London: Johnson and Phillips, Ltd., 1925. xi, 400 p. illus. 8°. **VGI (Johnson)**

p. 51: "Transformer and oil specifications;" p. 51–53: "Temperature rise, overloads." Tabulated permissible overloads when the normal full load temperature rise of the transformer is below 50° C. in oil, or when the temperature of the air immediately surrounding the transformer does not exceed 30° C. without the temperature of the oil exceeding 90° C.; p. 55: "Specification J. & P. Class 'A' Special non-sludging transformer oil;" p. 56: "Specification J. & P. Class 'B' standard transformer oil;" p. 170–189: "Dispatch, installation, and maintenance of oil-immersed self-cooled transformers, including drying out on site;" p. 179: "Drying out of oil;" p. 179–181: "Oil filter press;" p. 181–185: "Centrifugal oil purifier;" p. 184–189: Apparatus and method for testing dielectric strength; p. 324–325: "Failures in the dielectric circuit;" p. 375–382: "Transformer oil." Requirements embracing dielectric strength, viscosity, sludging tendency, loss by evaporation, flash point, solidification point, specific heat, freedom from acids, alkalis, sulphur, moisture, and foreign matter, specific gravity and coefficient of expansion; p. 383–400: "B.E.S.A. specification no. 148, 1923." Classification and temperature limits, general tendency to sludge, loss by evaporation, flash point, solidification, disruptive strength, acid value, saponification value, freedom from deleterious sulphur, packing, and tests and methods.

670. **Tychinin,** B., and N. Butkov. Formation of sludge in transformer oil. (Chemical abstracts, Easton, v. 19, 1925, p. 2561.) **PKA**

Abstract from *Neftjanoe Slancevoe Chozjajstvo,* v. 7, p. 341–349, 1924.

Sludge consists of salts of organic acids produced by oxidation of the oil. Oxidation is accelerated by lead, and to a lesser degree by copper; zinc, tin and iron do not affect the action. A test for determining sludging characteristic is given.

671. **Utica Gas and Electric Company.** Secifications for insulating oils. (Electrical world, New York, v. 85, 1925, p. 1224.) **VGA**

1925, continued.

672. **Van Brunt,** Charles, and P. Schuyler Miller. Reclamation of automobile crank-case oil. (Industrial and engineering chemistry, Easton, v. 17, 1925, p. 416–423.) † **VOA**

Describes apparatus and method for treating used oil hot with a small quantity of concentrated sodium silicate solution. A sludge is formed which precipitates out all solid and other deleterious matter. The diluents are subsequently removed.

673. **Vidmar,** Milan. Aktuelle Fragen aus dem Transformatorenbau. (Elektrotechnik und Maschinenbau, Wien, Jahrg. 43, 1925, p. 699–704.) † **VGA**

674. **Wedmore,** E. B., and D. V. Onslow. Electrical engineers data book; v. 1: Lighting, traction and power distribution. London: Ernest Benn, Limited, 1925. xxi, 518 p. cxcv. illus. 8°. **VGE (Onslow)**

p. 504: "The Kissling test"; p. 505: "Effect of moisture and impurities on the breakdown voltage of oil," (curve); "B. S. specifications for insulating oils for use in transformers, oil switches and circuit-breakers (no. 148)," covering general requirements, tendency to sludge, loss by evaporation, flash point, viscosity, cold test, disruptive strength, acid value, saponification value, and methods of testing therefor; p. 512: Testing for iodine value; p. 515: Method of sampling oil for tests.

675. —— Electrical engineers data book; v. 2: Manufacture, design and laboratory work. London: Ernest Benn, Limited, 1925. xvi, 276 p., app. i–cxcv. illus. 12°. **VGE (Onslow)**

p. 128: Oils for varnishes; p. 150: Kissling sludge test; p. 150–152: Electric strength and purification with De Laval centrifugal separator; p. 152–171: British Standard specification no. 148, for insulating oils for use in transformers, oil switches, and circuit-breakers, covering general requirements, tendency to sludge, loss by evaporation, flash point, viscosity, cold test, disruptive strength, acid value, saponification and the presence of sulphur. Methods are given for testing for sludging, evaporation, Pensky-Martin method of flash point determination, Redwood's test for viscosity, acid tests, and disruptive strength; p. 185–186: Sparkover voltages in oil; p.189–194: Ignition and limits of inflammability of gases.

676. **Wellauer,** M. Die praktische Messung der elektrischen Festigkeit von Transformatorenölen mittelst verschiedener Funkenstrecken. (Schweizerische elektrotechnische Verein, Bulletin, Zürich, Jahrg. 16, 1925, p. 169–179.) † **VGA**

Abstracted in *Elektrotechnik und Maschinenbau,* Wien, Jahrg. 43, 1925, p. 916–917, † *VGA; Electrical world,* New York, v. 85, 1925, p. 1410–1411, *VGA.*

Recommends the use of disk electrodes or cylinder electrodes on the ground that they give more consistent results than sphere or needle electrodes. Discusses the effect of time and nature of application, and the number of times applied on the results obtained.

677. **Zimmermann,** W. Über Durchschlagsfestigkeitsmessungen an Isolierölen. (Archiv für Elektrotechnik, Berlin, Bd. 15, 1925, p. 271–295.)

Comparison is made of the methods, results and conclusions of Friese, Hayden and Eddy, Schroeter, Spath, Engelhardt, and Draeger with particular attention to the size, shape and position of the electrodes as an explanation of the discrepancies of the kv per cm measurements obtained by these investigators.

AUTHOR INDEX

Figures refer to number of entry. An asterisk (*) indicates that the reference is made to discussion on the paper of that entry number.

A

Addenbrooke, G. L., 136.
Allen, I. C., 137, 159.
Almy, J. E., 1.
Alsaker, Fred, 307.
American Institute of Electrical Engineers. — Standards Committee: Wires and Cables Sub-committee, 404.
American Society for Testing Materials, 228, 339, 368-369, 412, 454, 508-509, 525-527, 533, 585-587.
Anderson, C. T., 162.
Andry-Bourgeois, 605.
Anklam, 606.
Archibald, R. D., 161.
Arkansas Central Power Company, 665.
Armstrong, G. E., 160.
Atkins, W. R. G., 340.

B

Babcock, H. D., 59.
Bachmann, R., 230.
Bacon, R. F., 231.
Balloul, A., 388.
Barbillion, L., 405.
Barr, J. R., 161.
Basler, C. D., 341.
Battle, J. R., 232, 308-309, 342.
Bauer, Bruno, 233-234, 280, 303.
Baum, F. G., 15.
Bearce, H. W., 138, 235.
Beck, 607.
Belinne, C. L., 358.
Bell, G. E., 608.
Benischke, Gustav, 189.
Bergk, Kurt, 468.
Berninger, Alois, 111-112.
Biermanns, Josef, 253.
Blanchard, C. B., 162.
Bohle, Hermann, 113.
Bohnenblast, J. P., 590.
Bolam, J. H., 43.
Boller, W., 609.
Borden, Douglas, 343.
Bouchet, L., 205, 371.
Bouzon, Raymond, 310.
Bowker, W. R., 528.
Brauen, W., 188.
Breth, F., 139.
Bridge, A. J., 372.
Briscoe, H. V., 661.
British Electrical and Allied Industries Research Association, 406, 455.
British Engineering Standards Association, 456.
British Thomson-Houston Company, 610.
Brown, Ralph, 457.
Browning, William, 44, 53.
Bruehlmann, G., 407, 458.
Buch, A., 163.
Buch, Fred, 164.
Buck, Theodor, 459.
Bueltemann, 281.
Butkov, N., 670.
Butman, C. A., 282-283.

C

Canadian Electrical Society, 42.
Carter, E. S., 540.
Casimir, E., 460.
Charitschkow, K., 54.
Charpentier, P., 311, 373, 461.
Chattock, R. A., 206.
Chesney, C. C., 55.
Cheyney, A. B., 87.
Christie, C. V., 614.
Churcher, E. G., 462.
Clark, F. M., 615.
Clark, H. H., 140, 165.
Clark, L. H., 616.
Clinker, R. C., 11.
Clostre, Jean, 391.
Coates, W. A., 374, 529.
Coggleshall, K. M., 258.
Cole, H. L., 463.
Cole, Harold, 530.
Collis, A. G., 207.
Comitato elettrotecnica italiano, 531.
Condit Electrical Manufacturing Company, 532.
Coolidge, W. D., 616a.
Cooney, W. H., 572, 617.
Cox, D. C., 533.
Crago, A. C., 618.
Creighton, E. E. F., 408.
Crocker, R. W., 165.
Crossfield, A. S., 159.
Crussard, P., 464.

D

Dalzell, D. R., *534, 619.
Dann, W. M., 313, 465-466, 534.
Dannatt, C., 620.
Davey, W. P., 621.
Davies, D. R., 409.
Dawson, C., 410.
Day, D. T., 411.
Dean, E. W., 345.
Delbridge, T. G., 412.
Del Mar, W. A., 375, 413, 536-537.
Demuth, Walter, 468.
DeWeese, F. C., 538.
DeWolf, R. D., 89.
Dieterle, R., 539.
Digby, W. P., 91, 208.
Doherty, R. E., 540.
Dow, J. C., 92.
Draeger, Kurt, 541.
Drefuss, L., 542.
Drouin, F., 5.
DuBois, Delafield, 414, *926.
Duckham, Alexander, 114, 346.
Duckworth, Alexander, 115.
Dunsheath, P., 376.
Dunstan, A. E., 237.
Dwyer, W. O., 174.

E

Earhart, R. F., 46.
Eby, E. D., 166, 622.
Eddy, W. N., 426-427, 477.
Egloff, G., 278.
Elden, L. L., 150.
Elkin, R. I., 259.
Engelhardt, Viktor, 543.
Erickson, S. F., 284.
Escard, Jean, 116.
Escholz, O. H., 315, 469.
Estorff, Walter, 415, 470-471, 623.
Evans, E. A., 377.
Evershed, S., 167.

F

Faccioli, G., 80.
Fachini-Somazzi, 624.
Fahrenwald, A. W., 378.
Farmer, F. M., 168, 210, 379, 416.
Ferguson, S., 169.
Fernie, F., 625.
Ferranti Company, 208.
Fischer, 93.
Fischer, Albert, 626-627.
Fleischmann, L., 209.
Fleming, A. P. M., 170, 380, 417.
Fleming, R. T., 381.
Fletcher, F. S., 261.
Flight, W. S., 171, 285, 348, 382, 418, *427, 473.
Flowers, A. E., 628.
Fokes, L., 629.
Foley, H. S., 474.
Fortescue, C., 172, 180.
Foster, H. A., 173.
Fowle, F. F., 419.
Frank, Fritz, 546.
Frank, J. J., 117, 174.
Franz, Hermann, 468.
Fraser, M. A., 286.
Friese, R. M., 349.
Fuchs, F. C., 287.

G

Garrard, C. C., 191, 350, 547.
Gealey, E. J., 420.
Gehrkins, E. F., 94.
General Electric Company, 118, 288-289, 317.
Georgia Railway and Power Company, 247.
Gérard, Léon, 95.
Germann, T., 56, 71-72.
Gewecke, H., 210.
Gibbs, J. B., 421.
Gifford, R. D., 96.
Gill, A. H., 318.
Gill, A. J., 641.
Girault, P., 146.
Gittins, G. E., 383.
"Gluckauf," pseud., 64-65.
Granier, J., 384.
Gray, T. T., 82.
Green, F. C., 141.
Grempe, G. M., 211.
Groschuff, E., 120.
Grossman, H., 238.
Gruen, Ad., 351, 475.
Guenther-Schulze, Adolf, 422, 548.
Guilbert, C. F., 423.

H

Hall, C. H., jr., 424.
Hammerschlag, H. A., 82.
Hamor, W. A., 231.
Hanson, C. F., 413, 537.
Hapgood, C. H., 385, 476.
Hardin, L. H., 425.
Harris, F. W., 175, *207.
Harvey, Dean, 631.
Hatschek, E., 121.
Hayden, J. L. R., 97, *413, 426-427, 477-478.
Heinicke, H., 549.
Hejda, C. J., 352.
Hendricks, A. B., jr., 122, *426.
Henry, 98.
Hentschel, Ludwig, 632.
Herschel, W. H., 353.
Hewlett, E. M., 22.
Heyden, Hans von der, 550-558, 633-637.
Hiecke, Rich., 479.
Hill, L. H., 480.
Hilliard, J. D., 428, 560.
Hills, S. M., 56, 71-72.
Hilton, J. R., 319.
Hinrichsen, F. W., 142.
Hirobe, T. W., 262.
Hitchcock, L. H., 66.
Hodgman, H. H., 143.
Hodnette, J. K., 618.
Hoeg, Fritz, 561.
Holde, David, 12, 23, 57, 73, 212, 429.
Hooper, P. N., 144.
Humann, Paul, 16.
Hunter, P. V., *181.

I

Institution of Electrical Engineers. — Research Committee, 176.
Institution of Electrical Engineers. — Research Committee: Sub-Committee on Insulating Oils, 239.

J

Jackson, R. P., 320.
Jacobs, W. A., 137.
Jaffé, George, 74.
Jakob, Max, 430.
Jenks, J. S., 562.
Johannsen, S. E., 177.
Johansen, E. M., 431.
Johnson, R., 170.
Johnson and Phillips, Ltd., 669.
Jones, S. F., 483.
Jukes, H. D., 563.

K

Kapp, Gisbert, 638.
Kasimir, E., 460.
Kehse, Walter, 386.
Kelber, C., 354.
Kellogg, D. R., 534.
Kempe, H. R., 639.
Kennelly, A. E., 265.
Kessler, 6.
Kintner, S. M., 47.
Kissling, Richard, 48, 58, 67, 75, 564.
Klein, Josef, 213.
Knoblauch, Emil, 145.
Kock, F., 214.
Kouwenhoven, W. B., 76.
Krammer, Anton, 321.
Kreyssig, 355.
Krukowski, W. von, 210.

Kryspsin, J., 484.
Kubo, S., 262.
Kuechler, Rud., 485.

L

Lacey, H. M., 669.
La Fayette Electrical Manufacturing Co., 52.
La Gorce, P. de, 146-147, 565.
Langley, J. W., 17.
Langmuir, Irving, 178-179.
Lapiné, M., 640.
Laporte, F., 147.
Lapp, G. W., 432.
Lawson, C. S., 215.
Léauté, André, 123.
Leboucher, Paul, 356.
Lee, A. G., 641.
Le Ghait, E. R., 643.
L'Eplattenier, O., 566.
Lewis, W. W., 433.
Lewkowitsch, J. I., 486.
Lichtenberg, Chester, 290.
Linn, Max, 642.
Lockhart, L. B., 357.
Lof, E. A., 505.
Low, G. P., 14.
Lubowsky, Kurt, 567.
Luke, G. E., 487.
Lustgarten, *91.
Lyndon, Lamar, 241.

M

McBerty, F. H., 628.
McConahey, W. M., 148, 180.
McDowell, Louise S., 567a.
MacKay, T. C., 306.
Mackey, W., 266.
Mackie, J. K., 242.
McLaughlin, T. A., 387.
MacNeil, J. B., 434, *560, 568.
Malclès, Louis, 99–100, 216.
Mandi, A., 489.
Marbury, R. E., 643.
Marcusson, J., 35, 49, 124, 182, 196, 291, 443, 581.
Martineau, Albert, 267-268.
Marvin, R. H., 243.
Marx, Alfred, 490.
Matthis, A. R., 358, 491, 644.
Maude, A. H., *534, 658.
Meares, J. W., 492.
Mellis, D. B., 91.
Mercier, H., 435.
Merriam, E. B., *207.
Meyer, G. W., 25.
Meyerheim, G., 126.
Michaud, F., 388.
Michie, A. C., 181.
Miller, Francis, 292.
Miller, J. A., jr., 493.
Miller, P. S., 672.
Moeller, Ernst, 645.
Molnar, G., 79.
Moloney, T. O., 7.
Monkhouse, Allan, 380.
Montgomery, M. S., 293.
Montsinger, V. M., 244, 269-270, 323, 569-572, 615.
Moody, W. S., 26, 80, 324, 494.
Moore, E. J., 495.
Morrell, R. S., 646.
Moulton, J. H., 495.
Mueller, J., 325.
Mueller, J. F., 647.
Muellner, Friedrich, 496.
Muenzinger, Friedrich, 217.
Muller, Richard, 389.

N

Nastjukow, A. M., 149.
National Electric Light Association. — Electrical Apparatus Committee, 150, 436, 648.
National Electric Light Association. — Prime Movers Committee, 573.
Neale, R. E., 492.
Nedder, 649.
Nicholson, A. H., 650.
Niethammer, F., 245.
Norlin, Evert, 574.
Nuttall, W. H., 390, 575.

O

Oelschlaeger, R., 651.
Ogawa, 262.
O'Gorman, Mervyn, 8.
Onslow, D. V., 674-675.
Ontario Hydro-Electric Power Commission, 343.
Orr, Frank, 577.

P

Pagliani, Stefano, 327.
Palme, A., 302.
Peabody, R. M., 652.
Peaslee, W. D., *207.
Peck, E. P., 247.
Peek, F. W., jr., *168, 218-220, 246.
Peffer, E. L., 235.
Peoples Light Company, Davenport, Ohio, 598.
Perlewitz, Kurt, 296.
Peterson, W., 127.
Philip, Arnold, 328.
Philipp, A., 497.
Physikalisch-technische Reichenanstalt, 133.
Pittman, Ralph, 498.
Pollard, F. E., 103.
Polychronis, C., 249.
Poynton, F. Y., 608.
Pumphrey, L. J., 37.
Pungs, L., 153.

Q

Quinn, E. A., 221.

R

Radcliffe, L. G., 249, 297.
Randall, K. C., 104, 222.
Rayner, E. H., 154.
Reamer, Ronald, 628.
Rebora, Gino, 500.
Recklinghausen, Max von, 19.
Redwood, Sir Boverton, 438.
Reed, E. G., 298, 329, 501, 654-655.
Reid, J. B., 272.
Reiner, St., 656.
Reisset, A., 155.
Rengade, Étienne, 391.
Rice, C. W., 502, 578.
Rice, E. W., jr., 28.
Robertson, David, 113.
Rockworth, K. G., 250.
Rodman, C. J., 392-393, 439-440, 503-504, 657-658.
Rosa, E. B., 59.
Roval, P., 659.
Rozières, Jean, 490.
Ruehle, 579.
Rushmore, D. B., 505.
Russell, Alexander, 60.
Ryan, H. J., 38, 128.

S

Salathe, Albert, 660.
Sammett, M. A., 39.
Sampson, E. R., 441.
Sayce, L. A., 661.
Scal, Clair, 335.
Scheidel-Western X-Ray Company, 229.
Schendell, G., 300.
Schering, H., 580.
Schreiber, F., 105.
Schreiber, K. A., 223.
Schroeder, Hugo, 251.
Schroeter, F., 506.
Schrottke, F., 361.
Schwab, Ernst, 224.
Schwaiger, Anton, 195, 330, 442.
Schwartz, F., 129, 182, 196, 443, 581.
Schweidler, Egon, Ritter von, 3, 9.
Schweitzer & Conrad, Inc., 662.
Schweizerische elektrotechnische Verein, 233-234, 256, 280, 303.
Scott, E. K., 29.
Sessions, W. S., 10.
Seymour, Hartland, 582.
Shanklin, G. B., 444.
Shaw, P. E., 51, 61.
Shepherd, C. H., 301.
Sherman, H. C., 82.
Shrader, J. E., 331, 445, 664.
Shurgar, W. G., 665.
Sieber, F., 583.
Simon, A., 183.
Simons, D. M., 446.
Sinclair, C. T., 394.
Skinner, C. E., 30-31, 40-41, 273, 362.
Skinner, M. E., 507.
Slepian, J., *426.
Sligh, T. S., jr., 584.
Smith, W. H., 197.
Snyder, E. A., 508-509, 585-587.
Sorensen, R. W., 274.
Sorge, Joachim, 589.
Southcombe, J. E., *91, 130.
Southern California Edison Company, 160.
Southern Power Company, 517.
Spath, Walter, 570.
Staeger, Hans, 447, 511-513, 590-592, 666-668.
Stark, D. D., 345.
Stauffacher, E. R., 593.
Steels, O., 396.
Steinmetz, C. P., 97, 478.
Stephens, H. O., 117, 302.
Stern, Georg, 252-253, 448, 514-515.
Stern Sonneborn Company, 192.
Stigant, S. A., 669.
Still, Alfred, 275, 332, 397, 594.
Sumner, W. A., 655.
Swann, W. F. G., 157.
Sweden. — Statens Provningsanstalt, 574.
Sylvester, C., 595.
Symons, H. D., 131, 145.
Szilas, Oskar, 184.

T

Tank, Franz, 225.
Taylor, T. S., 334.
Taylor, W. T., 132, 185.
Tesche, O., 596.
Thole, F. B., 237.
Thomsen, T. C., 364.
Tobey, H. W., 84, 107.
Tobler, F., 597.
Tokyo Electrotechnical Laboratory, 262.
Torché, P., 303.
Torchio, Phillip, 398.
Treat, R. B., 63.
Tuttle, J. B., 197.
Tychnin, B., 670.
Typke, Kurt, 550-558, 633-637.

U

Ulbrich, E., 351, 475.
Ulzer, Ferd., 86.
Union des syndicats de l’électricité, 365, 395.
United States. — Bureau of Mines, 140.
United States. — Bureau of Standards, 138, 197, 353, 366.
United States. — Federal Specifications Board, 449, 519.
Urbain, Ed., 335.
Utica Gas and Electric Company, 671.

V

Vacuum Oil Company, 208.
Van Brunt, Charles, 672.
Verband deutscher Elektrotechniker. — Kommission für Isolierstoffe, 520.
Verband schweizerische Elektrizitätswerke, 233-234, 256, 280, 303.
Vereinigung der Elektrizitätswerke, 276-277, 316, 399, 450, 521.
Vidmar, Milan, 400-401, 600, 673.
Villemontée, Gouré de, 200-202.
Voege, W., 33.
Vogel, F. J., 601.
Vogelsang, Max, 236, 254, 336.

W

Wade, G. W., 177.
Wagner, H. E., 305.
Warburg, 3.
Waters, C. E., 108-109, 134, 186, 255, 337, 402, 451.
Weber, H. C. P., 306, 522, 602.
Weber, Robert, 20.
Wedmore, E. B., 403, 452, 674-675.
Weed, J. M., 135.
Weinberger, A., 227.
Weiss, H., 203.
Wellauer, M., 676.
Wenger, J., 603.
Wernicke, Karl, 68.
Westinghouse Electric and Manufacturing Company, 41, 445.
Whitehead, J. B., *426.
Wiebe, H. F., 187.
Wild, L. W., 110.
Wills, G. M., 523.
Wilson, G. O., 204.
Wilson, T. A., 621.
Wilson, W., 524.
Winnipeg Electric Railway Company, 102.
Wirt, H., 4.
Wirth, Th., 351.
Wiseman, R. J., 265.
Wood, F. E., 66.
Wood, H. R., 646.
Wood, O. D., *427.
Wynne, R. H., 602.
Wyssling, 256, 303.

Z

Zanetti, J. E., 278.
Zimmermann, W., 677.
Zipp, H., 453, 604.

SUBJECT INDEX

Figures refer to number of entry. An asterisk (*) indicates that the reference is made to discussion on the paper of that entry number.

A

Absorption of moisture by oil. *See* Moisture, Absorption.
Acidity of oil, Testing for, 223, 239, 285, 300, 350, 531, 533.
Acids:
  Effect of, on dielectric strength of oil, 412, 494.
  Removal of, by use of fuller's earth, 181, 633–634.
Acids in oil, Action of, on cotton insulation. *See* Cotton, Action of oil oxidation products on.
Air bubbles, Effect of, on dielectric strength of oil, 387, 621.
Air and oil, Comparative dielectric properties of, 128.
Alfa-Laval centrifugal separators, 626, 630.
Alkalinity of oil, Testing for, 239, 300, 531.
Allgemeine Elektrizitäts-Gesellschaft, Specifications for switch and transformer oils, 23.
Alternating current, Effect of, on dielectric strength, 60, 91, *91, 136, 147, 214, 218, 220, 246, 265, 310, 477, 510, 541, 569, 571, 632, 641. *See also* Frequency, Effect of, on dielectric strength, and Direct current, Effect of, on dielectric strength.
Aluminum:
  Action of carbon tetrachloride on, 254.
  Effect of, on formation of sludge, 266, 402, 551–553, 590, 592.
  Effect of, on oxidation of oils, 266, 402, 551–553, 590–592.
  Radiation from, 572.
Aluminum arresters, Formation of sludge in, 408.
American Society for Testing Materials:
  Sludge tests (general), 454, 508–508a, 586–587, 666, 668.
  Formolite sludge test (revised), 508a.
  German "9" sludge test (revised), 508a.
  Life test for sludge, 508, 586–587.
  Michie sludge test (modified), 454, 508a.
  Oxidation test, 584, 666, 668.
American Transformer Company, oil testing set, 248.
Amylene, Dielectric properties of, 8.
Analine, Thermal conductivity of, 502, *502, 578.
Arc length, Relation of power factor to, 233.
Arcing voltage on oiled pressboard, 122.
Arc-over due to carbon deposits, 516.
Arcs:
  Action of, on oil, 43, 87, 91, 183, 208, 245, 290, 311, 335, 366, 411, 434, 503, 516, 534, 560, *560, 562, 568, 597, 642, 666.
  Action of oil in quenching, 18, 36–37, 87, 169, 175, 183, 208, 222, 233–234, 245, 253, 290, 311, 335, 386, 407, 434, 503, 547, 560, *560, 562, 631, 644. *See also* Arcs, Nature of, in oil.
  Energy of, 97, 232–233, 280, 311, 409. *See also* Arcs, Nature of; Arcs, Voltage across.
  Energy of, relation of, to heat generated, 233, 280, 409.
  Heat of, 111–112, 233, 280, 409.
  Heat of, relation of arc energy to, 233, 280, 409.
  Nature of, in carbon tetrachloride, *207, 254, 335, 352.
  Nature of, in oil, 207, *207, 222, 233–234, 280, 290, 311, 386, 409, 458, 568.
  Nature of, in pentachlorethane, 252.
  Nature of, in water, *208.
Arcs, *continued:*
  Nature of, effect of contact size and shape on, 207, *207, 233–234, 245, 434, 644.
  Pressure of, in oil, 207, *207, 209, 245, 280, 311, 409, 428, 434, 458.
  Voltage across, *207, 233. *See also* Arcs, Energy of.
Argon, Use of, over oil in transformers, 534.
Asbestos paper in oil, Dielectric properties of, 382.
Asphalt base water-proofing compounds, Action of insulating oil on, 34.
Association suisse des électriciens, Specifications for switch and transformer oils, 666.
Atmospheric conditions, Effect of, on temperature rise of oil-immersed windings, 162, 172, 174, 244, 540, 567, 572.

B

Babbitt metal, Effect of, on sludge formation, 455.
Barrels for oil. *See* Drums for oil.
Barriers in oil. *See* Series insulation; also under names of materials in oil.
[Belgium.] Comité électrotechnique belge sludge test, 666.
Benzene:
  Dielectric properties of, 8, 331, 371, 567a.
  Thermal decomposition of, 237, 278.
Benzine, Dielectric properties of, 6, 8–9.
Benzinoform. *See* Carbon tetrachloride.
Benzol:
  Dielectric properties of, 1, 8–9, 214, 422, 427, 439.
  Nature of electrical conduction through, 205.
Bibliographies on insulating oil and allied subjects, 154, 237, 340, 404, 422, 431, 444, 446, 473, 487, 502, 534, 540–541, 548, 632.
Bismuth, Effect of, on oxidation of oil, 266.
Black surface, Radiation from, 135, 495, 572.
Blends, Viscosity of, 353.
Blends as substitutes for insulating oils, 82, 175, 238, 254, 353, 439, 503, 602.
"Bostonia", Dielectric properties of, 567a.
Brass:
  Effect of, on formation of sludge, 402, 455, 503, 592, 668.
  Radiation from, 135.
Breakdown voltage:
  Effect of electrode material on, 589.
  Effect of electrode size and shape on, 91, 107, 123, 127–128, 133, 168, 171, 195, 210, 218, 265, 317, 379, 403, 418, 423, 427, *427, 442, 459, 481, 539, 542, 570, 589, 644, 676. *See also* Dielectric strength; Dielectric properties; Sparking distance; Sparking voltage; also name of material.
Breaking capacity of oil switches, Relation of oil characteristics to, 560.
Breathers, 317, 319, 503, 611.
Breathing effect in transformers, 319, 534.
British Engineering Standards Association:
  Specifications for switch oil, 456, 638, 674–675.
  Specifications for transformer oil, 456, 638, 669, 674–675.
British Thomson-Houston evaporation test, 239.
British Thomson-Houston filter press, 190, 199.

Bromine sludge test, 454, 508. *See also* Iodine sludge test.
Brown Boveri filter-paper oven, 257.
Brown Boveri filter press, 257, 260, 518.
Brown Boveri sludge test, 447, 464, 511, 635, 637, 666–668.
Bushings:
  Deposition of carbon on, from oil, 516.
  Oil-filled, 26, 84, 166, 275, 332, 374, 397, 433, 529, 622.
Butyric acid, Effect of, on dielectric strength of oil, 17.

C

Calcium, Effect of, on sludge formation, 551.
Calcium carbide, Dehydration of oil with, 107.
Calcium chloride, Dehydration of oil with, 293.
Calcium oxide, Dehydration of oil with, 107.
Cambric, varnished, in oil, Dielectric properties of, 246, 265, 560, 570.
Cans for oil, 30–31. *See also* Drums for oil.
Capillarity of oil through leads, 2, 26, 92, 261, 268, 272, 284, 292, 304, 315.
Carbon, free, Effect of, on dielectric strength of oil, 91, 139, 171, 204, 427, *427, 516, 562, 657.
Carbon deposit from oil, Electric leakage through, 516.
Carbon dioxide, Solubility of, in oil, *534.
Carbon monoxide, Solubility of, in oil, 658.
Carbon tetrachloride:
  Action of, on aluminum, 254.
  Action of, on fibrous insulation, 254.
  Action of, on lead, 254.
  Action of, on metals, 254, 336.
  Action of, on mica, 254.
  Action of, on pertinax, 254.
  Action of, on rubber, 254.
  Action of, on silver, 254.
  Action of, on tin, 254.
  Action of, on vulcanite, 254.
  Arcs in, nature of, *207, 254, 335, 352.
  Dielectric properties of, 254, 344, 439.
  Thermal conductivity of, 502, *502, 576.
  Use of, as a fire extinguishing agent, 256, 258, 394, 606.
  Volatility of, overcoming by covering with a layer of glycerine, 254.
Carbon tetrachloride fuses, 307. *See also* Schweizer and Conrad fuses.
Carbon tetrachloride as a substitute for insulating oil, 122, 175, 236, 254, 259, 280, 307, 315, 335, 344, 352, 362–363, 492.
Carbonization of oil:
  By arcing, 43, 87, 91, 183, 208, 245, 290, 311, 335, 366, 411, 434, 503, 516, 534, 560, *560, 562, 568, 597, 642, 666.
  Effect of impurities on, 134.
  Relation of iodine number, flash-point, fire-point, evaporation to, 255. *See also* Arc, Action of, on oil; Carbon, free, Effect of, on dielectric strength of oil; Heating, Effect of, on dielectric strength of oil.
Carbonization test (U.S.B.S.), 366, 584.
Cast iron surfaces, Radiation from, 117, 135, 487.
Castor oil, Dielectric properties of, 8, 51, 61, 214, 331, 419, 567a, 664.
Catalysts, Effect of, on formation of sludge. *See* Sludge formation, Effect of catalysts, various materials, metals, salts, conditions, etc., on; Oxidation of oil, Effect of catalysts, various materials, metals, salts, conditions, etc., on.
Catalytic oxidation of oil. *See* Oxidation of oil, Effect of catalysts on; Sludge formation, Effect of catalysts on.
Cavitation in oil, Theory of, 207.
Centrifugal motion, Dehydration of oil by, 107, 385, 467, 476, 483, 488, 493, 499, 523, 563, 591, 603, 609, 613, 616, 626–627, 631, 659, 669, 674–675.
Centrifugal separators:
  Alfa-Laval, 626, 630.
  De Laval, 467, 613, 675.
  Empson, 576.
Cerium, Effect of, on oxidation of oil, 266.
Characteristics of insulating oils, Tabulations of, 23, 48, 91, 285, 327, 340, 436, 563.
Chemical neutrality. *See* Neutrality, chemical; Acidity of oil; Alkalinity of oil.
Chlorethyl acetate, Effect of, in transformer oil, 602.
Chloroform:
  Dielectric properties of, 439.
  Effect of, in transformer oil, 602.
Choice of insulating oil, Consideration of fire risk in, 6.
Chromium, Effect of, on oxidation of oil, 266.
Circuit-breakers, oil, Explosions of, 169, 183, 217, 227, 256, 280, *290, 303, 322, 336, 342, 361, 364, 409, 503, 549, 560, *560, 562.
Cloth, oiled, Dielectric properties of, 66, 154, 615.
Cloth in oil, Dielectric properties of, 218, 382, 615.
Cloud test, 368, 527.
Coal tar base water-proofing compounds, Action of insulating oil on, 34.
Cobalt:
  Effect of, on oxidation of oil, 266.
  Effect of, on sludge formation, 401, 455.
Cobalt acetate, Effect of, on sludge formation, 455.
Cod-liver oil, Dielectric properties of, 51.
Coefficient of expansion of oil, 91, 239.
Cold test, 30–31, 368, 407, 527, 531.
  Archbutts, 455.
Colloidal suspensions in oil, Electrical precipitation of, 424.
Comitato elettrotecnico italiano, Specifications for switch and transformer oils, 531.
Comité électrotechnique belge sludge test, 666.
Compounds, impregnating. *See* Petrolatum; Impregnation compounds; and names of materials.
Compounds, water-proofing. *See* Waterproofing compounds.
Compressed gas over oil in transformers, 45.
Compressed gas as a substitute for insulating oil, 38.
Conduction, Nature of electrical, through liquids, 200–202, 205, 216, 225, 331, 388.
Conductivity of oiled contacts, 44, 53.
Conductor size, Relation of, to corona formation in oil, 80.
Conrad fuse. *See* Schweitzer and Conrad fuse.
Conservator, Use of, on oil switches to prevent explosions, 227.
Conservator for transformers, 324, 469.
Constantan, Effect of, on sludge formation, 668.
Contacts, Size and shape of, effect on nature of arc, 207, *207, 233–234, 245, 434, 644.
Contacts, oiled, Conductivity of, 44, 53.
Cooling action of oil. *See* Thermal conductivity of oil.
Cooling coils for oil, 55, 164, 232, 279, 457, 474. *See also* Cooling systems, forced oil; Radiators; Radiation; Tanks; Thermal conductivity.
Cooling curves:
  For oil switches, 382, 500.
  For transformers, 113, 161, 269–270, 323, 383, 500.
  See also Heating curves.
Cooling of gases in oil switches as means of preventing ignition, 280.
Cooling of transformers, oil as compared to air, 25, 28–29, 96, 600.
Cooling systems, forced oil, 55–56, 84, 164, 301, 305, 333, 389, 400, 463, 474, 505, 514, 605, 614, 616, 652. *See also* Cooling coils; Radiation; Radiators; Tanks; Thermal conductivity.

Copper:
  Action of carbon tetrachloride on, 254.
  Effect of, on oxidation of oil, 266, 300.
  Effect of, on sludge formation, 181, *181, 188, 208, 300, 402, 438, 447, 455, 503, 511, 551–553, 559, 592, 637, 666, 668, 670.
  Radiation from, 487.
Copper particles, Effect of, on dielectric strength of oil, 657.
Copper precipitate, Effect of, on sludge formation, 455.
Copper sulphate method of detecting moisture in oil, 30–32, 208, 242, 341.
Corona formation in oil, 80, 128, 218, 220, 275, 283, *426–*427, 542, 618.
  Effect of conductor size on, 80.
  Means of generating, 618.
Corrugations, Radiation from, 117, 135, 487, 640. *See also* Ribs, Radiation from.
Cotton insulation, Action of oil oxidation products on, 300, 447, 501, 511, 531, 666, 668.
Cotton seed oil, Dielectric properties of, 8, 17, 419.
Creepage failure, 122, 570, 601.
Crude oil, Dielectric properties of, 8.
Cylinder oil, Dielectric properties of, 17.
Czecho-Slovakia, Specifications for transformer oil in, 367.

D

Dark gray tanks, Radiation from, 495.
Decomposition, thermal, of organic liquids, 237.
Dehydration of oil, 30–31, 47, 63, 85, 107, 506.
  By calcium carbide, 107.
  By calcium chloride, 293.
  By calcium oxide, 107.
  By centrifugal motion, 107, 385, 467, 476, 483, 488, 493, 499, 523, 563, 591, 603, 609, 613, 616, 626–627, 631, 659, 669, 674–675. *See also* Centrifugal separators.
  By centrifugal motion, Criticism of, 591, 597, 609.
  By dry air, 29, 94, 101, 107.
  By filtering, 107, 148, 150, 215, 250, 333, 364, 419, 421, 435, 499, 505–506, 538, 545, 591, 597, 605, 609, 627, 631, 659, 665–666, 669.
  By heating, 29, 47, 101, 370, 659, 666.
  By metallic sodium, 69–70, 78, 83, 88, 232.
  Comparison of filter press and centrifugal methods, 591, 597.
De Laval centrifugal separator, 467, 613, 675.
Delaval-Watson oil-testing set, 535, 559.
Density of oil, Relation of, to expansion, 138, 235.
Deoxidizing material for transformers, 465, 534.
Deterioration of oil by arcing, 43, 87, 91, 183, 208, 245, 290, 311, 335, 366, 411, 434, 503, 516, 534, 560, *560, 562, 568, 597, 642, 666.
"Diamond paraffine", Dielectric properties of, 362.
Dichlorethylene, Effect of, in transformer oil, 602.
Dichlormethane:
  Dielectric properties of, 439.
  Effect of, in transformer oil, 602.
Dielectric breakdown of liquids:
  Mechanism of, 122, 128, *168, 171, 220, 282–283, 331, 376, 413, 418, 426, *426, 427, *427, 478, 506, 510, 541, 570, 621, 625, 651. *See also* Breakdown voltage; Dielectric strength; Ionization of oil; Ionic mobility in liquid dielectrics; Dielectric fatigue; Electric endosmose.
  Photographic study of, 651.
Dielectric constants:
  For impregnated pressboard, 122.
  For insulating oils, 122, 320, 325, 509, 608, 632, 645, 661.
Dielectric fatigue, 3, 9.
Dielectric hysteresis. *See* Dielectric loss.
Dielectric lag, 478, 536, 643.
Dielectric loss:
  Effect of field strength on, 632.
  Effect of frequency on, 273, 282, 509, 567a, 641, 645, 664.
  Effect of power factor on, 273, 509, 641, 645, 664.
  Effect of temperature on, 632.
  Measurement of, 273, 282–283, *413, 565, 567a, 620, 632, 645, 664.
Dielectric loss of oiled cloth, 154.
Dielectric properties:
  American transformer oils, 48, 285.
  Amylene, 8.
  Benzene, 8, 331, 371, 567a.
  Benzol, 1, 8, 214, 422, 427, 439.
  "Bostonia", 567a.
  Carbon tetrachloride, 254, 344, 439.
  Castor oil, 8, 51, 214, 331, 419, 567a, 664.
  Cloth, oiled, 66, 154, 615.
  Cloth in oil, 218, 382, 615.
  Cod-liver oil, 51.
  Cotton seed oil, 8, 17, 419.
  Crude oil, 8.
  Cylinder oil, 17.
  "Diamond paraffine", 362.
  Dichlormethane, 439.
  Ether, 8.
  Fusel oil, 51.
  Gargoyle oils, 422, 452.
  General Electric transil oil no. 6, 141, 218.
  General Electric transil oil no. 10, 141, 436, 570.
  Glycerine, 8, 567a.
  Halogen compounds, 439.
  Halogenated hydrocarbons, 439.
  "Halowax oil", 315, 602.
  Heptane, 61.
  Hexane, 371, 589.
  "Hi-flash" oil, 331, 602, 664.
  High gravity oils, 8.
  "Immutol", 452.
  Impregnated fibrous insulation, 643.
  Impregnated paper, 66, 154, 167, 536–537, 615, 632.
  Impregnated pressboard, 122, 569–570, 615.
  Kerosene, 8.
  "Lactroseal", 240, 331, 602, 664.
  Lard oil, 8, 17, 419.
  Lemon oil. 8.
  Linseed oil, 8, 17, 51, 77, 419.
  Mica in oil, 154, 173, 218, 615.
  Micafolium in oil, 382.
  Micanite in oil, 382.
  Micarta in oil, 282, 382.
  Monochlorbenzol, 439.
  Moulded composition in oil, 382.
  Neats foot oil, 8, 419.
  Nonane, 8.
  Nut oil, 8.
  Octane, 51.
  Oil vapor, 348, 440.
  Olive oil, 51, 419, 567a.
  Orthodichlorbenzol, 439.
  Paper in oil, 218, 382, 489, 536, 615, 632.
  Paraffine oil, 8, 51, 97, 153, 214, 282, 419, 422, 567a.
  Pentachlorethane, 252.
  Pentadecanes, 8.
  Pentane, 51, 61.
  Pertinax in oil, 93.
  Petrolatum, 477, 537.
  Petroleum, 1, 8, 123, 214, 422.
  Pressboard in oil, 218, 380, 406, 569–570, 615.
  Rape oil, 8, 51, 61.
  Red fibre in oil, 382.
  Resin oils, 8, 43, 110, 153, 188, 666.
  Rubber in oil, 168, 218.

Dielectric properties, *continued:*
  Series insulations, 66, 154, 168, 218, 246, 265, 282, 310, 325, 330, 332, 380, 382, 406, 418, *427, 459, 489, 536–537, 560, 569–570, 601, 615, 618. *See also under* names of materials in oil.
  Sperm oil, 8, 419.
  Terebinth, 371.
  Toluene, 8, 567a.
  Toluol, 9, 214.
  Transil oil no. 6, 141, 218.
  Transil oil no. 10, 141, 436, 570.
  Turpentine, 1, 8, 51, 419, 422, 567a.
  Varnished cambric in oil, 246, 265, 560, 570.
  Varnished pressboard in oil, 122, 615.
  Vaseline, 8, 90, 99, 371.
  Water, distilled, 8, 91.
  Xylene, 331, 371, 567a.
  Xylol, 1, 8, 422, 589, 645.
Dielectric strength of oil:
  Effect of acids on, 17, 412, 494.
  Effect of air bubbles on, 285, 387, 621.
  Effect of alternating-current on, 60, 91, *91, 136, 147, 214, 218, 220, 246, 265, 310, 477, 510, 541, 569, 571, 632, 641.
  Effect of alternating-current and time on, 246.
  Effect of copper particles on, 657.
  Effect of direct-current on, 60, 91, *91, 136, 146, 246, 310, 477, 510, 541, 621.
  Effect of direct-current and time on, 246, 632.
  Effect of dust on, 65, 114, 262, 285, 387, 419, 510, 659.
  Effect of fibers on, 376, *427.
  Effect of free carbon on, 91, 139, 171, 204, 427, *427, 503, 516, 562, 657.
  Effect of frequency on, 136, 146, 153, 171, 218, 220, 541, 569, 571, 601.
  Effect of high frequency on, 218, 220, 265, 641.
  Effect of impulse voltage on, 218, 220.
  Effect of impurities on, 17–18, 65, 243, 342, 349, 376, 418, 426, 478, 536, 541, 543, 570, 651, 674.
  Effect of mechanical pressure on, 171, 214, 349, 418.
  Effect of moisture on, 30–31, 40–41, 52, 65, 95, 107, 122, 127, 141, 167, 171, 188, 191, 204, 218, 232, 246, 257, 260, 262, 328, 350, 412–413, 419, 421, *427, 494, 528, 541, 543, 562, 571, 621, 643, 657, 659, 666, 674.
  Effect of moisture on at various frequencies, 250.
  Effect of sludge on, 171, 188, 412.
  Effect of temperature on, 17, 60, 86, 90–91, 107, 111–112, 139, 141, 153, 214, 218, 282–283, 349, 382, 398, 407, 418, 477, 515, 585.
  Effect of thickness on, 1, 122, 171, 218, 477.
  Effect of time on, 3, 123, 139, 218, 371, 477, 536, 541, 569-570, 585, 589.
  Effect of time lag on, 478, 536.
  Effect of wave shape on, 110, 171, 214, 541, 585
  Measurement of, 4, 30–31, 63, 91, 204, 223, 285, 346, 410, 438, 441, 484, 486, 539, 631. *See also* Oil-testing set; Test cup.
  Measurement of, with megger, 91.
Dielectric strength of various liquids and of solids oiled and in oil. *See* under name of material.
Direct-current, Effect of, on dielectric strength of oil, 60, 91, *91, 136, 146, 246, 310, 477, 510, 541, 621, 632. *See also* Alternating current, Effect of, on dielectric strength.
Discharge potential. *See* Breakdown voltage; Dielectric properties; Sparking distance; Sparking potential.
Disk and needle gap, Electrostatic field between, 107.
Disks, Electrostatic field between, 107.
Disruptive voltage. *See* Breakdown voltage; Dielectric properties; Sparking distance; Sparking potential.
Distillation methods of detecting moisture, 137, 391-392, 445.
Drums for oil, 30-31. *See also* Cans for oil.
Drying of oil. *See* Dehydration of oil.
Drying outfit, General Electric, using heated air, 101.
Duckham oil, Effect of wave shape on dielectric strength of, 110.
Dust, Effect of, on dielectric strength of oil, 65, 114, 262, 285, 387, 419, 510, 659. *See also* Copper particles: Fibers; Free carbon; Impurities.

E

Editorials, 236, 264, 363.
Effect of oil on mica, 5, 7, 13, 93.
Electric endosmose of moisture in oil, 167, *413, 414, *426, 506.
Electric field, Effect of, on formation of sludge, 561.
Electric precipitation of colloidal suspensions in oil, 424.
Electrical conduction, Nature of, through liquids, 200-202, 205, 216, 225, 331, 388.
Electrodes:
  Effect of shape and size of, on breakdown voltage, 91, 107, 123, 127-128, 133, 168, 171, 195, 210, 218, 265, 317, 379, 403, 418, 423, 427, *427, 442, 459, 481, 539, 542, 570, 589, 644, 676.
  Effect of shape and size on electrostatic field of, 91, 107, 122, *427.
  Horizontal vs. vertical, 481.
  Material of, effect on breakdown voltage, 589.
  See also Test cup.
Electrostatic forces in oil switches, 87.
Electrostatic wattmeter, 154, 273, 620.
Empson centrifugal separator, 576.
Empson oil testing set, 576.
Endosmose of moisture in oil, 167, *413, 414, *426, 506.
Energy of arcs, 97, 232-233, 280, 311, 409.
  Relation of heat generated to, 233, 280, 409.
Energy loss. *See* Dielectric loss.
Ether, Dielectric properties of, 8.
Ethyl chloracetate, Effect of, in transformer oil, 602.
Ethylene, Thermal decomposition of, 237.
Ethylene bromide, Effect of, in transformer oil, 602.
Evaporation:
  Relation of, to carbonization of oil, 255.
  Testing for, 30-31, 186, 228, 285, 339.
Evaporation test:
  British Thomson-Houston, 239.
  Michie, 239.
  Waters, 186.
Excello fuse liquid, 352.
Expansion chamber, 156, 364, 629.
Expansion of oil, 138, 235, 364.
  Coefficient of. *See* Coefficient of expansion of oils.
Explosibility of gases in switches and transformers, 315, 440, 503, 666. *See also* Explosive limits of oil vapour.
Explosion chambers for circuit breakers, 458, 547, 562.
Explosions, oil switch, 169, 183, 217, 227, 256, 280, *290, 303, 322, 336, 342, 361, 364, 409, 503, 549, 560, *560, 562.
Explosions, transformer, 14, 39, 315, 324, 342, 364, 465, 469, 480, 494, 503, 534, *534.
Explosions, Relation of flash and fire points to likelihood of switch and transformer, 315.
Explosive limits of oil vapor, 440, 503, 675.

F

- Fatigue, Dielectric, 3, 9.
- Ferranti sludge test, 208, 447, 464.
- Ferric oxide, Effect of, on formation of sludge, 134, 402.
- Fibers, Effect of, on dielectric strength of oil, 376, *427.
- Fibers in oil, Effect of electric stress on, 376, 387, 506, 651.
- Fibrous insulation:
  - Action of carbon tetrachloride on, 254.
  - Dielectric properties of, 122, 643.
  - *See also* Fullerboard; Cloth; Paper.
- Filter bed, 293, 528.
- Filter-paper oven, 441.
  - Brown-Boveri, 257.
  - Metropolitan-Vickers, 372.
- Filter press, 148, 150, 215, 250, 333, 364, 419, 421, 435, 505, 545, 591, 665.
  - British Thomson-Houston, 190, 199.
  - Brown-Boveri, 257, 260, 518.
  - General Electric, 118, 151, 158.
  - Improvised, 577.
  - Metropolitan-Vickers, 372.
  - Portable, 518, 612, 650, 653.
  - Simplex, 314.
  - Westinghouse, 152.
- Filtering, Dehydration of oil by, 107, 148, 150, 215, 250, 333, 364, 419, 421, 435, 499, 505-506, 538, 545, 591, 597, 605, 609, 627, 631, 659, 665-666, 669.
- Fire extinguishing devices for station use, 256, 258, 296, 394, 606.
- Fires, transformer, 6, 14, 25, 28, 39, 79, 104, 256, 259, 303, 342, 534.
- Fish oil:
  - Dielectric properties of, 17.
  - Thermal decomposition of, 237.
- Flame point, Determination of, 30-31, 49, 159, 285, 525, 527.
- Flash point of oil:
  - Determination of, 12, 30–31, 49, 106, 187, 204, 215, 239, 300, 464, 524-527.
  - Effect of added halogenated hydrocarbons on, 602.
  - Relation of, to carbonization of oil, 255.
- Flow of oil, Measurement of, at various temperatures, 496.
- Forced oil cooling systems, 55-56, 84, 164, 301, 305, 333, 389, 400, 463, 474, 505, 514, 605, 614, 616, 652.
- Formolite sludge test, 124, 149, 181, 239, 454, 508a, 512, 574, 587.
- Formolite sludge test (revised A.S.T.M.), 508a.
- Free carbon, Effect of, on dielectric strength of oil, 91, 139, 171, 204, 427, *427, 516, 562, 657.
- Frequency:
  - Effect of, on dielectric loss, 273, 282, 509, 641, 645, 664.
  - Effect of, on dielectric properties of oil, 136, 146, 153, 171, 218, 220, 265, 541, 569, 571, 601, 641.
- Fuller's earth, Purification of oil with, 181, 633-634.
- Fullerboard in oil, Dielectric properties of, 282, 382, 601.
- Fusel oil, Dielectric properties of, 51, 61.
- Fuses, carbon tetrachloride, 307.
- Fuses, oil-immersed high-tension, 373a.
- Fuses, Schweitzer and Conrad, 662.

G

- Galalithe, 116.
- Gargoyle oil, Dielectric properties of, 422, 452.
- Gas, compressed:
  - Substitute for insulating oil, 38.
  - Use of, over oil in transformers, 45.
- Gas percentage indicator, 140, 165.
- Gas pressure indicator, 140, 165.
- Gases:
  - Explosibility of, in switches and transformers, 315, 440, 503, 666.
  - Generation of, in oil switches, 125, 183, 280, 300, 311, 322, 326, 336, 409, 428, 434, 440, 458, 461, 549, *560, 562, 666.
  - Generation of, in oil switches, method for computing volume, 461, *560, 562, 666.
  - Generation of, in transformers, 14, 315, 472.
  - Solubility of, in oil, *534, 658.
  - *See also* Oil vapour; Explosibility; Explosions.
- Gases from oil, Explosive limits of, 315, 440, 503, 675.
- Gelatine impregnation compound, 116.
- General Electric Company oil-testing set, 193, 288, 317, 359-360.
- General Electric Company warm air oil-drying outfit, 101.
- General Electric filter press, 118, 151, 158.
- General Electric heated air transformer drying outfit, 101.
- General Electric oil no. 6, Dielectric properties of, 141, 218.
- General Electric oil no. 10, Dielectric properties of, 141, 436.
- Generation of corona in oil, 618.
- German "9" sludge test, 454, 508a, 587. *See also* Verband deutscher Elektrotechniker sludge test.
- Glass, Radiation from, 135.
- "Glow tube" method of measuring conductivity of oil, 618.
- Glycerine:
  - Dielectric properties of, 8, 567a.
  - Thermal conductivity of, 502, *502, 578.
- Glycerol, Effect of, on formation of sludge, 181.
- Gravity filter bed, 293, 528.
- Gray tanks, Radiation from, 495.
- Green tanks, Radiation from, 572.
- Grey fiber in oil, Dielectric properties of, 382.
- Gun metal, Effect of, on sludge formation, 455.

H

- Hackethal insulation, 116.
- Halogen compounds, Effect of, in transformer oil, 439, 602.
- Halogenated hydrocarbons, Dielectric properties of, 439.
- "Halowax oil":
  - Characteristics of, 315, 602.
  - Mixture of, with transformer oil, 602.
- Handling of oil, 143, 285, 294, 507, 582, 631. *See also* Shipping of oil.
- Heat of arcs, 111-112, 233, 280, 409.
  - Relation of arc energy to, 233, 280, 409.
- Heat transfer. *See* Thermal conductivity.
- Heating:
  - Dehydration of oil by, 29, 47, 101, 370, 659, 666.
  - Detection of moisture by, 30-31, 91, *91, 425.
  - Effect of, on dielectric strength of oil. *See* Temperature, Effect of, on dielectric strength.
  - Effect of, on oxidation of oil, 105, 255, 475.
- Heating curves:
  - For oil switches, 409.
  - For tanks, 213.
  - For transformers, 213.
  - *See also* Cooling curves.
- Heating of tanks, 11, 336, 383, 485, 640.
- Helium, Use of, over oil in transformers, 534.
- Hemisphere, hollow, and needle, Electrostatic field between, 107.
- Heptane, Dielectric properties of, 51, 61.
- Hexachlorethane, Effect of, in transformer oil, 602.

Hexane:
  Dielectric loss in, 645.
  Dielectric properties of, 9, 51, 371, 589.
  Thermal decomposition of, 237.
"High-flash oil," Dielectric properties of, 331, 602, 664.
High frequency, Effect of, on dielectric strength of oil, 218, 220, 265, 641.
High gravity oils, Dielectric properties of, 8.
High tension testing set for measurement of dielectric strength of oil in the field. *See* Oil-testing sets.
High tension testing sets for laboratory use, 97, 122, 154, 273, 283, 310, 618, 620–621.
Hollow hemisphere and needle, Electrostatic field between, 107.
Horizontal vs. vertical electrodes for oil testing, 481.
Hydrocarbons, Thermal decomposition of, 237.
Hydrocarbons, halogenated, Dielectric properties of, 439.
Hydrogen, Solubility of, in oil, 658.
Hysteresis, dielectric. *See* Dielectric loss.

I

Ice, Formation of, in switch tanks, 562, 642.
"Immutol", Dielectric properties of, 452.
Impregnated fibrous insulation, Dielectric properties of, 122, 643.
Impregnated paper, Dielectric properties of, 66, 154, 167, 536-537, 615, 632.
Impregnated pressboard, Dielectric properties of, 122, 569-570, 615.
Impregnation compounds, 116, 306, 375, 398, 536-537.
  Dielectric loss in, effect of moisture on, 413, *413.
  Dielectric strength ratio of, with direct and alternating current, 478.
  Formation of vapour pockets in, at bends in cable, *413.
  Ionic mobility in, 413.
Improvised filter press, 577.
Improvised oil-testing set, 498.
Impulse voltage, Effect of, on dielectric strength of oil, 218, 220.
Impurities, Effect of, on dielectric strength of oil, 17-18, 65, 243, 342, 349, 376, 418, 426, 478, 536, 541, 543, 570, 651, 674.
  See also Copper particles; Dust; Free carbon; Fibers; Moisture.
Indian ink, Radiation from, 135.
Indicator for measuring pressures exerted on oil by arcs, 208.
Indicators:
  Chemical, use of, in testing for neutrality of oil, 91.
  Gas percentage, 140, 165.
  Gas pressure, 140, 165.
Inert gas, Use of, over oil, 217, 227, 280, 465, 469, 480, 534, 555, 559, 658.
Insulating oil:
  Effect of halogen compounds on, 439, 602.
  Explosibility of, relation of, to vapor pressure, 315.
  Solubility of gases in, 534, 658.
  Specifications for. *See* Switch oil, specifications; Transformer oil, specifications.
  Thermal conductivity of, 4, 20, 36, 74, 96, 135, 175, 213, 222, 239, 334, 400-401, 430, 462, 487, 502, *502, 596, 640.
Insulators, oil, 116, 299.
Interfacial tension, Relation of, to sludging characteristic of oil, 575.
Interfacial tension of oils, 378, 575.
Interfacial tension sludge test, 575.
Iodine number, Relation of, to carbonization of oil, 255.
Iodine number determination, 197, 285, 431.
  Hanus method, 197, 239, 431.
  Hüebl method, 239, 431, 455.
  Wijs method, 239, 431.
Iodine sludge test, 249, 454, 491, 508, 574, 587, 674-675.
Iodine value, Relation of, to sludging tendency of oils, 249, 491.
Ion baffle theory, 413.
Ionic mobility in impregnated paper, 413.
Ionic mobility in liquid dielectrics, 90, 99, 225, 413, *413, 541, 625.
Ionization of oil, 128, 225, 282. *See also* Ionic mobility in liquid dielectrics.
Iron:
  Effect of, on oxidation of oil, 266.
  Effect of, on sludge formation, 181, *181, 402, 438, 455, 503, 551, 553, 559, 590, 592, 668, 670.
Iron oxide, Effect of, on formation of sludge, 134, 402.
Isohexane, Thermal decomposition of, 237.
Ivory, Radiation from, 135.

J

Johnson and Phillips, Ltd., specifications for transformer oil, 669.
Johnson and Phillips oil-testing set, 599.

K

Kaiserlich-Königlich Technologische Gewerbe-Museum in Wien, Specifications for transformer oil, 111.
Kerosene, Dielectric properties of, 8, 46.
Kissling sludge test, 58, 67, 75, 182, 443, 447, 574, 581, 587, 637, 668, 674-675.
Krypton, Use of, over oil in transformers, 534.

L

"Lactroseal," Dielectric properties of, 240, 331, 602, 664.
Lag, dielectric, 478, 536, 643.
Lamp black, Radiation from, 135.
Lard oil, Dielectric properties of, 8, 17, 419.
Lead:
  Action of carbon tetrachloride on, 254.
  Effect of, on oxidation of oil, 266.
  Effect of, on sludge formation, 181, 208, 455, 503, 551, 553, 592, 666, 670.
Leads, Siphoning of oil through, 2, 26, 92, 261, 268, 272, 284, 292, 304, 315.
Leakage through carbon deposit from oil, 516.
Lemon oil, Dielectric properties of, 8.
Length of arc in oil, Relation of power factor to, 233.
Life test, American Society for Testing Materials, 508, 586-587.
Light gray tanks, Radiation from, 495.
Lightning arresters, aluminum, Formation of sludge in, 408.
Limonene, Dielectric properties of, 371.
Lines of force, Effect of electrode shape on, 91, 107, 122, *427.
Linseed oil:
  Dielectric properties of, 8, 17, 51, 61, 77, 419.
  Effect of, on sludge formation, 134.
Linseed oil base water-proofing compounds, Action of transformer oil on, 34.
Litharge, Effect of, on sludge formation, 181, 208, 455.
Low-freezing mixture for oil switches, 141, 175, 597.

- Low temperatures:
  - Dielectric properties of insulating oil at, 122, 141, 407, 482, 666. *See also* Dielectric strength of oil, Effect of temperature on.
  - Insulating oil for, 141, 175, 597.

M

- Magnesium:
  - Effect of, on oxidation of oil, 266.
  - Effect of, on sludge formation, 551.
- Maintenance of insulating oil, 102, 104, 247, 304, 308, 329, 333, 346, 352, 364, 372, 419-420, 437, 441, 470, 488, 493, 506, 517-518, 538, 544, 582, 597-598, 603, 613, 616, 619, 623, 631, 633, 638, 642, 659, 665, 669. *See also* Dehydration of oil.
  - Cost of, 437, 616, 650.
- Manganan resistance in oil, 59, 462.
- Manganese, Effect of, on sludge formation, 181, 455.
- Marble, Radiation from, 135.
- Measurement of dielectric loss, 273, 282-283, *413, 565, 620, 632, 645, 664.
- Measurement of dielectric strength. *See* Dielectric strength, Measurement of.
- Mechanical pressure, Effect of, on dielectric strength of oil, 171, 214, 349, 418.
- Mechanism of breakdown of liquid dielectrics, 122, 128, *168, 171, 220, 282–283, 331, 376, 413, 418, 426, *426, 427, *427, 478, 506, 510, 541, 570, 621, 625, 651.
- Megger, Measurement of dielectric strength of oil with, 91, 274.
- Mercury, Effect of, on oxidation of oils, 266.
- Metals:
  - Effect of, on oxidation of oil, 266, 402, 411, 551–553, 558–559, 590, 592.
  - Effect of, on sludge formation, 181, 266, 402, 411, 438, 551–553, 558–559, 584, 590, 592, 658, 660. *See also* Sludge formation, Effect of various materials, metals, salts, conditions, etc., on; Oxidation of oil, Effect of various materials, metals, salts, conditions, etc., on.
- Methane, Solubility of, in oil, 658.
- Methyl orange, Use of, in testing for neutrality of oil, 91.
- Metropolitan-Vickers filter-paper oven, 372.
- Metropolitan-Vickers filter press, 372.
- Mica:
  - Action of carbon tetrachloride on, 254.
  - Effect of oil on, 5, 7, 13, 93.
- Mica in oil, Dielectric properties of, 154, 173, 218, 615.
- Mica silk in oil, Dielectric properties of, 382.
- Micafolium in oil, Dielectric properties of, 382.
- Micanite, Action of carbon tetrachloride on, 254.
- Micanite in oil, Dielectric properties of, 382.
- Micarta in oil:
  - Dielectric loss in, 282.
  - Dielectric properties of, 282, 382.
- Michie evaporation test, 239.
- Michie sludge test, 181, 584, 587, 666, 668, 674–675.
- Michie sludge test (modified), 239, 574.
- Michie sludge test (modified), A.S.T.M., 454, 508a.
- Moisture:
  - Action of, under electric stress, 167, *413, 414, *426, 506.
  - Detection of, 30–31, 89, 137, 223, 250, 328, 349, 369, 497, 656.
  - Detection of, by copper sulphate method, 30–32, 208, 242, 341.
  - Detection of, by distillation methods, 137, 391–392, 445.
- Moisture, *continued:*
  - Detection of, by heating methods, 30–31, *91, 425. *See also* Moisture, Detection of, by distillation methods.
  - Effect of, on dielectric strength of fibrous insulation, 643.
  - Effect of, on dielectric strength of oil, 30–31, 40–41, 52, 65, 95, 107, 122, 127, 141, 167, 171, 188, 191, 204, 218, 232, 246, 257, 260, 262, 328, 350, 412–413, 419, 421, *427, 494, 528, 541, 543, 562, 571, 621, 643, 657, 659, 666, 674.
  - Effect of, on power factor of oil, 664.
  - Effect of, on resistance of manganin in oil, 59.
  - Effect of, on sludge formation, 573.
- Moisture content, Determination of, 35, 137, 287, 341, 345.
- Monobromobenzene, Effect of, in transformer oil, 602.
- Monochlorbenzene, Effect of, in transformer oil, 602.
- Monochlorbenzol, Dielectric properties of, 439.
- Moulded composition in oil, Dielectric properties of, 382.

N

- Nature of arcs, Effect of contact size and shape on, 207, *207, 233–234, 245, 434, 644.
- Nature of arcs in carbon tetrachloride, *207, 254, 335, 352.
- Nature of arcs in oil, 207, *207, 222, 233–234, 280, 290, 311, 386, 409, 458, 568.
- Nature of arcs in pentachlorethane, 252.
- Neats foot oil, Dielectric properties of, 8, 419.
- Needle and disk gap, Electrostatic field between, 107.
- Needle and hollow hemisphere, Electrostatic field between, 107.
- Needle gap, Dielectric strength of oil with, at transient voltages, 97.
- Neutral gas over oil, Use of, 217, 227, 280, 465, 469, 480, 534, 555, 559, 658.
- Neutrality, chemical, Testing for, 91. *See also* Acidity of oil; Alkalinity of oil.
- Nickel:
  - Effect of, on oxidation of oil, 266.
  - Effect of, on sludge formation, 181, 402, 455, 590, 592.
- Nitrogen, Solubility of, in oil, *534, 658.
- Nitrogen over oil, Use of, 227, 280, 465. *See also* Neutral gas over oil, Use of.
- Nitro-prusside test for sulphur, 91.
- Nonane, Dielectric properties of, 8.
- Nut oil, Dielectric properties of, 8.

O

- Octane, Dielectric properties of, 51.
- Oil:
  - Arcs in, nature of, 207, *207, 222, 233–234, 280, 290, 311, 386, 409, 458, 568.
  - Natural circulation of, 135, 638.
  - Specifications for. *See* Transformer oil, Specifications for; Switch oil, Specifications for.
  - Thermal conductivity of, 4, 20, 36, 74, 96, 135, 175, 213, 222, 239, 334, 400–401, 430, 462, 487, 502, *502, 596, 640.
- Oil and air, Comparative dielectric properties of, 128.
- Oil cooling systems. *See* Convection; Cooling coils; Cooling systems; Radiation; Radiators; Tanks; Thermal conductivity.
- Oil fuses, 373a.
- Oil for outdoor equipment, 141, 175, 597.
- Oil oxidation products:
  - Action of, on cotton insulation, 300, 447, 501, 511, 531, 666, 668.
  - Effect of, on sludge formation, 134.

Oil pressure, Measurement of, in circuit-breakers when operating, 125.
Oil under pressure as a means of preventing explosions in oil switches, 217.
Oil switch explosions, 169, 183, 217, 227, 256, 280, *290, 303, 322, 336, 342, 361, 364, 409, 503, 549, 560, *560, 562. *See also* Explosibility of gases; Gases, Generation of; Transformer explosions.
Oil switch tank lining, 347, 383, 560, 568.
Oil switch tanks:
  Formation of ice in, 562, 642.
  Stresses in, 87, 125, 428, 560, 566, 568. *See also* Arcs, Pressure of, in oil; Oil switch explosions.
Oil switches:
  Cooling curves for, 382, 500.
  Generation of gases in, 125, 183, 280, 300, 311, 322, 326, 336, 409, 428, 434, 440, 458, 461, 549, *560, 562, 666.
  Throwing of oil in, 125, 256, *560, 568.
Oil vapour:
  Dielectric properties of, 348, 440.
  Explosive limits of, 440, 505, 675.
  See also Gases.
Oil-cooled transformers:
  Comparison of, with air-cooled, 25, 28–29, 39, 96, 128, 600.
  Comparison of, with water-cooled, 55.
Oil-immersed windings, Temperature rise of, 27, 135, 162, 485, 501, 515, 532, 572, 583, 617, 669.
  Effect of atmospheric conditions on, 162, 172, 174, 244, 540, 567, 572.
Oil-immersed X-ray tube, 616a.
Oil-impregnated paper, Dielectric properties of, 154, 167, 536–537, 615, 632.
Oil-impregnated pressboards, Dielectric properties of, 122, 569–570, 615.
Oil-testing set, 506.
  American Transformer Company, 248.
  Delaval-Watson, 535, 559.
  Empson, 576.
  General Electric, 193, 288, 317, 359–360.
  Improvised, 498.
  Johnson and Phillips, 599.
  Ontario Hydro-electric Power Commission, 343.
  Scheidel-Western X-Ray Company, 229.
  Siemens-Schuckert, 415, 471.
Oiled contacts, Conductivity of, 44, 53.
Oiled fibrous insulation:
  Dielectric properties of, 122, 643.
  Thermal conductivity of, 71.
Oiled paper, Dielectric properties of, 66, 154, 536–537, 615, 632.
Oiled pressboard:
  Dielectric constants of, 122.
  Dielectric properties of, 122, 470, 569, 615.
Oils:
  Characteristics of. *See* Characteristics of insulating oils; names of oils; names of manufacturers of insulating oils.
  Oxidation of. *See* Oxidation of oil.
Olefines, Thermal decomposition of, 237.
Olive oil:
  Dielectric properties of, 46, 51, 419, 567a.
  Thermal conductivity of, 502, *502, 578.
Ontario Hydro-electric Power Commission oil-testing set, 343.
Orthodichlorbenzene, Effect of, in transformer oil, 602.
Orthodichlorbenzol, Dielectric properties of, 439.
Outdoor equipment, Oil for, 141, 175, 597.
Over potential test for insulators, 432.
Oxidation of oil, 2–3, 203, 211, 231, 324, 351, 412, 465–466, 534, 555, 559, 629, 658.
  Effect of aluminum on, 266, 402, 551–553, 590, 592.
  Effect of bismuth on, 266.
  Effect of cerium on, 266.
Oxidation of oil, *continued:*
  Effect of chromium on, 266.
  Effect of cobalt on, 266.
  Effect of copper on, 266, 300.
  Effect of heating on, 105, 255, 475.
  Effect of iron on, 266.
  Effect of lead on, 266.
  Effect of magnesium on, 266.
  Effect of mercury on, 266.
  Effect of metals on, 266, 402, 411, 551–553, 558–559, 590, 592.
  Effect of metals on, minimizing, 559.
  Effect of nickel on, 266.
  Effect of salts on, 554–555, 558.
  Effect of silver on, 266.
  Effect of sodium on, 266.
  Effect of sulphur on, 451.
  Effect of sunlight on, 108, 402.
  Effect of tin on, 266.
  Effect of zinc on, 402.
  See also Sludge formation.
Oxidation products of oil, 54, 231, 297, 666.
  Action of, on cotton, 300, 447, 501, 511, 531, 666, 668.
Oxidation test (A.S.T.M.), 584, 666, 668.
Oxygen, Solubility of, in oil, *534, 658.
Ozone, Action of, on oil, 114.
Ozone sludge test, 198. *See also* Ferranti sludge test; Michie sludge test.

P

Paper, Oil permeability of, 537.
Paper, Impregnated:
  Dielectric constants of, 632.
  Dielectric loss in, 632.
  Dielectric properties of, 66, 154, 167, 536–537, 615, 632.
  Dielectric strength of, effect of thickness on, 632.
  Dielectric strength of, ratio with direct and alternating current, 477.
  Ionic mobility in, 413.
Paper, oiled, Dielectric properties of, 66, 154, 167, 536–537, 615, 632.
  Effect of thickness on, 154.
Paper in oil:
  Dielectric properties of, 218, 382, 489, 536, 615, 632.
  Mechanical strength of, effect of heating on, 501.
Paper, petrolatum-resin impregnated, 375.
Paper drying oven, 441.
  Brown-Boveri, 257.
  Metropolitan-Vickers, 372.
Para dichlorbenzene, Effect of, in transformer oil, 602.
Paraffin, Breakdown voltage of, relation of electrode size to, 123.
Paraffin oil:
  Dielectric properties of, 8, 46, 51, 61, 97, 153, 214, 282, 419, 422, 567a.
  Nature of electrical conduction through, 200–202, 205.
  Sparking voltage in, 46, 61.
  Thermal conductivity of, 20.
Pentachlorethane:
  Action of, on metallic parts of switches, 252.
  Arcs in, nature of, 252.
  Dielectric properties of, 252.
  Substitute for insulating oil, 252.
Pentadecanes, Dielectric properties of, 8.
Pentane:
  Dielectric properties of, 51, 61.
  Thermal decomposition of, 237.
Pertinax:
  Action of carbon tetrachloride on, 254.
  Dielectric properties of, in oil, 93.

Petrolatum, Dielectric properties of, 477, 537.
Petrolatum-resin impregnated paper, Relation of power factor and temperature in, 537.
Petroleum:
  Dielectric fatigue of, 9.
  Dielectric properties of, 1, 8, 123, 214, 422.
  Thermal conductivity of, 20, 576.
Petroleum ether, Nature of electrical conduction through, 205.
Phenol-phtalein, Use of, in testing for neutrality of oil, 91, 239.
Phosphor bronze, Effect of, on sludge formation, 402.
Pilite, Dielectric properties of, 116.
Plates, Electrostatic field between, 423.
Polarization of fibers in oil, 376, 387, 506, 651.
Portable filter press, 518, 612, 650, 653.
Potassium, Effect of, on sludge formation, 551.
Potential gradient of oil, 46, 91. *See also* Spark potential; Sparking distance in oil; Sparking voltage.
Pour test, 368.
Power factor of oil:
  Effect of, on arcs in oil switches, 233.
  Effect of moisture on, 664.
  Measurement of, 509, 664.
  Relation of, to dielectric loss, 273, 509, 641, 645, 664.
Precipitation, electrical, of colloidal suspensions in oil, 424.
Pressboard, impregnated, Dielectric properties of, 122, 569–570, 615.
Pressboard, varnished, Dielectric properties of, in oil, 122, 615.
Pressboard in oil, Dielectric properties of, 218, 380, 406, 569–570, 615.
Pressure, Indicators for gas, 140, 534.
Pressure, mechanical, Effect of, on dielectric strength of oil, 171, 214, 349, 418.
Pressure of arcs in oil, 207, *207, 209, 245, 280, 311, 409, 428, 434, 458.
Pressure recording instrument for oil in circuit-breakers, 280.
Pumps for oil, 55, 294, 370, 514, 616.
Puncture voltage. *See* Dielectric strength; Breakdown voltage.
Purification of oil:
  By combined action of centrifugal motion and an electric field, 490.
  With fullers earth, 181, 633–634.
  See also Dehydration of oil; Filtering of oil.

Q

Quenching action of oil, 18, 36–37, 87, 169, 175, 183, 208, 222, 233–234, 245, 253, 290, 311, 335, 386, 407, 434, 503, 547, 560, *560, 562, 631, 644. *See also* Arcs in oil, Nature of; Arcs, Action of oil on.

R

Radiation:
  From aluminum, 572.
  From brass, 135.
  From corrugations, 117, 135, 487, 640.
  From glass, 135.
  From ribs, 117, 135.
  From rolled steel, 117.
  From silver, 135.
  From tanks, 117, 135, 161, 178–179, 194, 270, 373, 383, 485, 495, 500, 540, 572, 578, 593, 640.
Radiators, 302, 338, 640. *See also* Cast iron surfaces; Corrugations; Ribs; Rolled steel surfaces; Tanks; Wrought iron surfaces.
Rape oil:
  Dielectric properties of, 8, 51, 61.
  Sparking voltage in, 61.
Reclamation of oil, 181, 628, 633–634. *See also* Dehydration of oil; Filtering of oil.
Red fibre in oil, Dielectric properties of, 382.
Red lead, Effect of, on sludge formation, 181, 208, 455.
Red tanks, Radiation from, 572.
Reesileo oils, Characteristics of, 452.
Refining method, Effect of, on sludge formation, 181, 634.
Relief valve for excessive pressures in inertaire transformers, 534.
Resin oils:
  Dielectric properties of, 8, 43, 110, 153, 188, 666.
  Oxidation of, 188.
Resins, Effect of, on sludge formation, 134, 503.
Resistance across oiled contacts, 44.
Resistance, specific, of insulating oil, 91.
Resistivity of oil, Relation of time and voltage to, 618.
Rheotan, Effect of, on sludge formation, 668.
Ribs, Radiation from, 117, 135.
Rolled steel, Radiation from, 117.
Rubber, Action of carbon tetrachloride on, 254.
Rubber in oil, Dielectric properties of, 168, 218.
Russian oil, Thermal decomposition of, 237.

S

Salts:
  Effect of, on oxidation of oil, 554–555, 558.
  Effect of, on sludge formation, 554–555, 558, 660,
Sampling of oil, 30–31, 91, 143, 226, 329, 421, 527, 610, 674.
Sampling thief, 527, 631.
Scheidel-Western X-Ray Company oil-testing set, 229.
Schied sludge test, 520, 637.
Schwartz and Marcusson tar number test, 196, 443, 581, 637, 667.
Schweitzer and Conrad Excello liquid, 352.
Schweitzer and Conrad fuse, 662.
Schweizerische elektrotechnische Verein, Specifications for switch and transformer oil, 666.
Series insulation:
  Dielectric properties of various materials and combinations of materials in oil, 66, 154, 168, 218, 246, 265, 282, 310, 325, 330, 332, 380, 382, 406, 418, *427, 459, 489, 536–537, 560, 569–570, 601, 615, 618.
  Dielectric strength of, effect of frequency on, 569.
  Dielectric strength of, effect of time on, 569.
  See also names of materials in oil.
Shape and size of electrodes:
  Effect of, on breakdown value of oil, 91, 107, 123, 127–128, 133, 168, 171, 195, 210, 218, 265, 317, 379, 403, 418, 423, 427, *427, 442, 459, 481, 539, 542, 570, 589, 644, 676.
  Effect of, on electrostatic field, 97, 107, 122, *427.
Shipping of oil, 160, 468, 582, 610, 631, 666. *See also* Cans; Drums.
Short duration sludge test. *See* Ferranti sludge test.
Siemens-Schuckert oil-testing set, 415, 471.
Silver:
  Action of carbon tetrachloride on, 254.
  Effect of, on oxidation of oil, 266.
  Radiation from, 135.
Silver nitrate test for sulphur, 91.
Simplex filter press, 314.
Siphoning of oil through leads, 2, 26, 92, 261, 268, 272, 284, 292, 304, 315.
Size and shape of electrodes, Effect of, on electrostatic field, 97, 107, 122, *427.
"Sludge accelerator," 573.

Sludge formation, 30–31, 41–42, 54, 85, 87, 114–115, 188, 206, 208, 215, 231, 285–286, 320, 350, 364, 377, 410, 416, 419, 438, 440, 447, 454, 491, 494, 503–504, 556, 573, 597, 637, 642, 644, 648.
  Causes of, 89, 196, 393, 503, 511, 513, 642, 660.
  Effect of metals on, 181, 266, 402, 411, 438, 551–553, 558–559, 584, 590, 592, 658, 660. *See also* Oxidation of oil, Effect of metals on; and under name of metals.
  Effect of metals on, means of minimizing, 559.
  Effect of aluminum on, 266, 402, 551–553, 590, 592.
  Effect of babbitt metal on, 455.
  Effect of brass on, 402, 455, 503, 592, 668.
  Effect of calcium on, 551.
  Effect of catalysts on, 181, 188, 208, 438, 511, 584, 592, 658, 660. *See also* Oxidation of oil, Effect of various materials, conditions, metals, salts, etc., on; Sludge formation, Effect of various materials, conditions, metals, salts, etc., on.
  Effect of cobalt on, 402, 455.
  Effect of cobalt acetate on, 455.
  Effect of constantan on, 668.
  Effect of copper on, 181, *181, 188, 208, 300, 402, 438, 447, 455, 503, 511, 551–553, 559, 592, 637, 666, 668, 670.
  Effect of copper precipitate on, 455.
  Effect of electric field on, 561.
  Effect of ferric oxide on, 134, 402.
  Effect of glycerol on, 181.
  Effect of gun metal on, 455.
  Effect of iron on, 181, *181, 402, 438, 455, 503, 551, 553, 559, 590, 592, 668, 670.
  Effect of lead on, 181, 208, 455, 503, 551, 553, 592, 666, 670.
  Effect of linseed oil on, 134.
  Effect of litharge on, 181, 208, 455.
  Effect of magnesium on, 551.
  Effect of manganese on, 181, 455.
  Effect of moisture on, 573.
  Effect of nickel on, 181, 402, 455, 590, 592.
  Effect of oxidation products on, 134.
  Effect of phosphor bronze on, 402.
  Effect of potassium on, 551.
  Effect of red lead on, 181, 208, 455.
  Effect of refining method on, 181, 634.
  Effect of resins on, 134, 503.
  Effect of rheotan on, 668.
  Effect of salts on, 554–555, 558, 660.
  Effect of soap on, 134.
  Effect of sodium on, 551.
  Effect of solder on, 455.
  Effect of specific gravity of oil on, 208.
  Effect of steel on, 402.
  Effect of sulphur on, 130, 134, 451.
  Effect of sunlight on, 108, 208, 402.
  Effect of temperature on, 131, 647.
  Effect of tin on, 503, 553, 590, 592, 668, 670.
  Effect of varnish on, 503.
  Effect of viscosity of oil on, 208.
  Effect of zinc on, 181, 402, 455, 552–553, 590, 592, 666, 670. *See also* Oxidation of oil, Effect of various metals, materials and salts.
  Effect of, on dielectric strength of oil, 171, 188, 412.
  Relation of, to oxidation of oil, 108, 131, 181, 324, 364, 412, 534, 584, 660, 670.
  Relation of iodine and bromine value to, 249, 255, 491.
  Solubility of, in petroleum ether, 504.
  Treatment of oil for the prevention of, 181.
  See also Oxidation of oil.
Sludge formation in aluminum arresters, 408.
Sludge formation in oil switches, 642.
Sludge tests, 73, 126, 129, 223, 300, 321, 377, 411–412, 452, 460, 504, 531, 636, 660, 670.
  American Society for Testing Materials, 454, 508–508a, 586–587, 666, 668. *See also* Sludge test: Life.
  Bromine absorption, 454, 508.
  Brown Boveri, 447, 464, 511, 635–637, 666–668.
  Carbonization (U.S.B.S.), 366, 584.
  Comité électrotechnique belge, 666.
  Ferranti, 208, 447, 464.
  Formolite, 124, 149, 181, 239, 454, 508a, 512, 574, 587.
  Formolite (revised A.S.T.M.), 508a.
  German "9," 454, 508a, 587.
  German "9" (revised A.S.T.M.), 508a.
  Interfacial tension, 575.
  Iodine, 454, 508, 574, 587, 674–675.
  Kissling, 58, 67, 75, 182, 443, 447, 574, 581, 587, 637, 668, 674–675.
  Life test (A.S.T.M.), 508, 586–587.
  Michie, 181, 584, 587, 666, 668, 674–675.
  Michie modified, 239, 574.
  Michie modified (A.S.T.M.), 454, 508a.
  Oxidation (A.S.T.M.), 584, 666, 668.
  Ozone, 198. *See also* Sludge test: Ferranti; Sludge test: Michie.
  Schied, 520, 637.
  Schwartz and Marcusson tar number test, 196, 443, 581, 637, 667.
  Short duration. *See* Sludge test: Ferranti.
  Sodium peroxide, 520, 637.
  Sweden. — Statens Provningsanstalt, 574.
  Union des syndicats de l'électricité, 447, 666, 668.
  Vacuum Oil Co., 208.
  Verband deutscher Elektrotechniker, 520, 637.
  Vereinigung der Elektrizitätswerke, 447–448, 464.
  Waters, 366, 584.
Soap:
  Effect of, on dielectric strength of oil, 17.
  Effect of, on sludge formation, 134.
Sodium:
  Drying of oil with, 69–70, 78, 83, 88.
  Effect of, on oxidation of oil, 266.
  Effect of, on sludge formation, 551.
Sodium, metallic, Dehydration of oil by, 69–70, 78, 83, 88, 232.
Sodium hydroxide, Purification of oil with, 181.
Sodium peroxide sludge test, 520, 637.
Sodium silicate, Use of, in reclaiming oils, 672.
Solder, Effect of, on sludge formation, 455.
Solubility of gases in oil, *534, 658.
Spark gap for oil testing. *See* Test cup.
Sparking distance in oil at transient voltages, 97.
Sparking voltage in oil, 43, 46, 61, 91, *91, 97, 170, 386, 675. *See also* Dielectric properties.
Specific capacity. *See* Dielectric constant.
Specific resistance of insulating oil, 91.
Specifications for insulating oil. *See* Switch oil, specifications; Transformer oil, specifications.
Sperm oil, Dielectric properties of, 8, 419.
Sphere gap:
  Dielectric strength of oil with, at transient voltages, 97.
  Source of error in use of, 243.
Spheres, Electrostatic field between, 107.
Steel:
  Effect of, on sludge formation, 402.
  Radiation from, 135.
Stern Sonneborn oil, Characteristics of, 192, 452.
Strength, dielectric. *See* Dielectric strength.
Substitutes for insulating oils:
  Blends, 82, 175, 238, 254, 353, 439, 503, 602.
  Carbon tetrachloride, 122, 175, 236, 254, 259, 280, 307, 315, 335, 344, 352, 362–363, 492. *See also* Carbon tetrachloride.

Substitutes for insulating oils, *continued:*
  Compressed gas, 38.
  Halogenated hydrocarbons, 439.
  Pentachlorethane, 252.
  Schweitzer and Conrad Excello liquid, 352.
Sulphur:
  Effect of, on oxidation of oil, 451.
  Effect of, on sludge formation, 130, 134, 451.
Sulphur in oil, 30–31, 337.
  Determination of, 91, 204, 300, 337, 527.
Sunlight:
  Effect of, on oxidation of oil, 108, 402.
  Effect of, on sludge formation, 108, 208, 402.
Sweden. — Statens Provningsanstalt sludge test, 574.
Sweden. — Statens Provningsanstalt specifications for transformer oil, 574.
Switch oil, 15, 19, 30–31, 36–37, 50, 72, 76, 300, 364, 381, 459, 479, 492, 529, 597, 631, 639, 666.
  Effect of low temperature on, 122, 141, 407, 482, 666.
Switch oil, Specifications for, 22–23, 30–31, 42–43, 56, 64, 76, 91, 170, 191, 241, 281, 300, 320, 350, 364, 638.
  Allgemeine Elektrizitäts Gesellschaft, 23.
  Association suisse des électriciens, 666.
  British Engineering Standards Association, 456, 638, 674–675.
  Comitato elettrotecnico italiano, 531.
  Schweizerische elektrotechnische Verein, 666.
  United States Federal Specifications Board, 449, 519.
  Utica Gas and Electric Company, 671.
  Verband deutscher Elektrotechniker, 520.
  Vereinigung der Elektrizitätswerke, 163, 276–277, 316, 330, 450, 453, 521, 580.
  See also Transformer oil, Specifications.
Switch oil for outdoor equipment, 141, 175, 597. *See also* Dielectric properties of insulating oil at low temperatures.
Switch tanks, Stresses in, 87, 125, 428, 560, 566, 568. *See also* Oil switch explosions; Arcs, Pressure of, in oil.

T

Tank lining, oil switch, 347, 383, 560, 568.
Tanking. *See* Handling of oil.
Tanks:
  Heating of, 11, 336, 383, 485, 640.
  Radiation from, 117, 135, 161, 178–179, 194, 270, 373, 383, 485, 495, 500, 540, 572, 578, 593, 640. *See also* Cooling curves; names of metals; Corrugations, Radiation from; Ribs, Radiation from.
  Stresses in oil switch, 87, 125, 428, 560, 566, 568. *See also* Oil switch explosions; Arcs, Pressure of, in oil.
  Temperature measurement of, 11, 485, 500.
  Temperature rise of transformers with various forms and materials for, 117, 373, 640.
Tanks, colored, Radiation from, 135, 495, 572. *See also* under name of color.
Tar, Dielectric properties of, 8.
Temperature:
  Effect of, on dielectric strength of oil, 17, 60, 86, 90–91, 107, 111–112, 139, 141, 153, 214, 218, 282–283, 349, 382, 398, 407, 418, 477, 515, 585.
  Effect of, on power factor, 664.
  Effect of, on sludge formation, 13, 647.
Temperature gradient in oil, 135, 177, 401, 500–501, 583, 617, 655, 669.
  Effect of load on, 655, 669.
Temperature indicators for transformers, 571, 647.
Temperature of oil, Determination of, 11, 16, 20, 27, 177, 180, 463, 500, 505, 532, 571, 617, 647.
Temperature of tanks, Measurement of, 11, 485, 500.
Temperature rise, Measurement of, 162, 177, 501, 530, 617, 647, 669.
Temperature rise of oil-immersed windings, 27, 135, 161–162, 485, 501, 515, 532, 572, 583, 617, 669.
  Effect of atmospheric conditions on, 162, 172, 174, 244, 540, 567, 572.
Temperature rise of transformer windings with oil removed, 27, 617.
Terebinth, Dielectric properties of, 371.
Test cup, 30–31, 91, 111–112, 122, 263, 271, 312, 418–419, 506, 539, 543, 570, 673. *See also* Electrodes; Oil-testing set.
Testing dielectric strength of oil, 4, 30–31, 63, 91, 204, 223, 285, 346, 410, 438, 441, 484, 486, 539, 631. *See also* Oil testing set; Test cup.
Testing for moisture. *See* Moisture, Detection of.
Testing set, high-tension, for laboratory use, 97, 122, 154, 273, 283, 310, 618, 620, 621.
Tetrachlordibromethane, Effect of, in transformer oil, 602.
Tetrachlorethane, Effect of, in transformer oil, 602.
Tetrachlorethylene, Effect of, in transformer oil, 602.
Theory of cavitation in oil, 207.
Thermal conductivity:
  Of aniline, 502, *502, 578.
  Of carbon tetrachloride, 502, *502, 576.
  Of glycerine, 502, *502, 578.
  Of impregnated fibrous insulation, 71.
  Of oil, 4, 20, 36, 74, 96, 135, 175, 213, 222, 239, 334, 400–401, 430, 462, 487, 502, *502, 596, 640.
  Of oil, effect of sludge on, 666.
  Of oil, relation of viscosity to, 6, 36, 175, 407, 487, 502, *502.
  Of oiled fibers, 71.
  Of olive oil, 502, *502, 578.
  Of paraffin oil, 20.
  Of petroleum, 20, 576.
  Of toluene, 502, *502, 578.
  Determination of, 20, 74, 160, 462, 502, *502.
Thermal decomposition of organic liquids, 237.
Thermally-operated valve for regulating flow of cooling medium, 654.
Thickness, Effect of, on dielectric strength of oil, 1, 122, 171, 218, 477.
Throwing of oil in oil switches, 125, 256, *560, 568.
Time, Effect of, on dielectric strength of oil, 3, 123, 139, 218, 371, 477, 536, 541, 569–570, 585, 589.
Time lag, in dielectric breakdown, 478, 536, 643.
Tin:
  Action of carbon tetrachloride on, 254.
  Effect of, on oxidation of oil, 266.
  Effect of, on sludge formation, 503, 553, 590, 592, 668, 670.
Tincture of cochineal, Use of, in testing for neutrality of oil, 91.
Toluene:
  Dielectric properties of, 8, 567a.
  Thermal conductivity of, 502, *502, 578.
  Thermal decomposition of, 237.
Toluol, Dielectric properties of, 9, 214.
Transformer cooling systems, forced oil, 55–56, 84, 164, 301, 305, 333, 389, 400, 463, 474, 505, 514, 605, 614, 616, 652.
Transformer explosions, 14, 39, 315, 324, 342, 364, 465, 469, 480, 494, 503, 534, *534. *See also* Explosibility of gases; Gases, Generation of; Oil switch explosions.
Transformer fires, 6, 14, 25, 28, 39, 79, 104, 256, 259, 303, 342, 534.
Transformer oil, 15, 19, 30–31, 36–37, 68, 72, 76, 81, 85, 89, 95, 98, 104, 107, 113, 132, 142, 155, 160–161, 163, 185–186, 189, 204, 224, 264, 313, 315, 330, 358, 362, 364, 381, 417, 419, 429, 438, 459, 473, 479, 484, 492, 505, 529, 531, 546, 548, 550, 555–556, 562, 579, 589, 594–595, 624, 639, 647, 649.

Transformer oil, *continued:*
  Characteristics of. *See* Characteristics of oils, Tabulations of.
  Effect of halogen compounds on, 439, 602.
  Effect of low temperature on, 122, 141, 407, 482, 666.
  Effect of, on mica, 5, 7, 13, 93.
  History of use, 362.
  Sparking voltage in, 61.
  Thermal conductivity of, 4, 20, 135, 364, 485.
Transformer oil, Specifications for, 23, 30–31, 42, 56, 64–65, 76, 91, 112, 115, 170, 173, 176, 191, 208, 231–232, 241, 281, 300, 309, 318, 320, 340, 342, 350, 357, 440, 486, 492, 501, 503, 564, 638, 644, 663, 669.
  Allgemeine Elektrizitäts Gesellschaft, 23.
  Association suisse des électriciens, 666.
  British Engineering Standards Association, 456, 638, 669, 674–675.
  Comitato elettrotecnico italiano, 531.
  Czecho-Slovakia, 367.
  Johnson and Phillips, Ltd., 669.
  Kaiserlich-Königliche Technologische Gewerbe-Museum in Wien, 111.
  Schweizerische elektrotechnische Verein, 666.
  Sweden. — Statens Provningsanstalt, 574.
  Union des syndicats de l'électricité, 365, 395, 435, 464.
  United States Army Aircraft Production Bureau, 342.
  United States Army Ordnance Department and Signal Corps, 357.
  United States Army Quartermaster Corps, 357.
  United States Federal Specifications Board, 449.
  United States Navy, 357.
  Utica Gas and Electric Company, 671.
  Verband deutscher Elektrotechniker, 520.
  Vereinigung der Elektrizitätswerke, 163, 276–277, 316, 330, 399, 447–448, 450, 453, 468, 521, 580. *See also* Switch oil, Specifications.
Transformer windings:
  Temperature rise in, 27, 135, 161–162, 485, 501, 515, 532, 572, 583, 617, 669.
  Temperature rise in, Effect of atmospheric conditions on, 162, 172, 174, 244, 540, 567, 572.
Transformers:
  Cleaning of, 143.
  Cooling curves for, 113, 161, 269–270, 323, 383, 500.
  Drying run of, 143.
  Heating curves for, 213.
  Measurement of temperature of, 11, 135, 177, 180, 184, 485.
  Oil cooling as compared with air cooling, 25, 28, 29, 39, 96, 128, 600.
  Oil cooling of, as compared to water cooling, 55.
Transient voltage, Effect of, on dielectric strength of oil, 97, 218–219.
Transient voltage generator, 97.
Transil oil, Dielectric strength of, ratio of with direct and alternating current, 477.
Transil oil no. 6, Dielectric properties of, 141, 218.
Transil oil no. 10:
  Dielectric properties of, 141, 436, 570.
  Dielectric strength of, effect of frequency on, 569–570.
Transil oil no. 12, Thermal conductivity of, 578.
Tubes, Radiation from, 640.
Turpentine:
  Dielectric properties of, 1, 8, 51, 61, 419, 422, 567a.
  Thermal decomposition of, 237.

U

Union des syndicats de l'électricité:
  Sludge test, 447, 666, 668.
  Specifications for transformer oil, 365, 395, 435, 464.
United States Army Aircraft Production Bureau specifications for transformer oil, 342.
United States Army Ordnance Department and Signal Corps specifications for transformer oil, 357.
United States Army Quartermaster Corps specifications for transformer oil, 357.
United States Federal Specifications Board:
  Specifications for switch oil, 449, 519.
  Specifications for transformer oil, 449.
United States Navy specifications for transformer oil, 357.
United States Standards Bureau carbonization test, 366, 584.
Used oil, Characteristics of, 91.
Utica Gas and Electric Company specifications for switch and transformer oils, 671.

V

Vacuum Oil Company sludge test, 208.
Valve, thermally-operated, 654.
Vapor, oil, Dielectric properties of, 348, 440.
Vapor pockets, Formation of, in cables, *413.
Vapor pressure of oil, Relation of, to explosibility, 315.
Varnish, Effect of, on sludge formation, 503.
Varnished cambric in oil, Dielectric properties of, 246, 265, 560, 570.
Varnished pressboard in oil, Dielectric properties of oil, 122, 615.
Vaseline:
  Dielectric properties of, 8, 90, 99, 371.
  Effect of passage of current on, 100.
  Ionic mobility in, 90, 99.
Vaseline oil-impregnated paper, Dielectric properties of, 632.
Verband deutscher Elektrotechniker:
  Sludge test, 520, 637. *See also* German "9" sludge test.
  Specifications for switch and transformer oil, 520.
Vereinigung der Elektrizitätswerke:
  Sludge test, 447–448, 464.
  Specifications for switch oil, 163, 276–277, 316, 330, 450, 453, 521, 580.
  Specifications for transformer oil, 163, 276–277, 316, 330, 399, 447–448, 450, 453, 468, 521, 580.
Viscosity of oil:
  Determination of, 91, 239.
  Effect of, on operation of oil switches, 175, 560, *560, 631.
  Relation of, to temperature, 91, 175, 188, 326–327, 666.
  Relation of, to thermal conductivity, 6, 36, 175, 407, 487, 502, *502.
Volatility of oil, Determination of, 204.
Voltage across arcs, *207, 233.
Voltage drop of oiled contacts, 44.
Voltax compound, 116.
Vulcanite, Action of carbon tetrachloride on, 254.

W

Water, distilled, Dielectric properties of, 8, 91.
Water-proofing compounds, Effect of oil on, 30–31, 34, 36.
Waters evaporation test, 186.
Waters sludge test, 366, 584.
Wattmeter, electrostatic, 154, 273, 620.
Wave form. *See* Wave shape.
Wave shape:
  Effect of, on arc energy in oil switches, 233.
  Effect of, on dielectric strength of oil, 110, 171, 214, 541, 585.
Westinghouse Electric filter press, 152.
Westinghouse Electric "Hi-flash" oil, Dielectric properties of, 331, 602, 664.
Westinghouse Electric "Lactroseal," Dielectric properties of, 240, 331, 602, 664.
Westinghouse Electric and Manufacturing Co., oil A, Characteristics of, 436, 439, *534, 618, 664.
Westinghouse Electric and Manufacturing Co., oil B, Characteristics of, 439.
Westinghouse Electric and Manufacturing Co., oil C, Characteristics of, 439.
"Westinghouse Standard gray" tanks, Radiation from, 459.
White lead, Radiation from, 135.
White tanks, Radiation from, 572.
Wilcox oil, Effect of wave shape on dielectric strength of, 110.
Windings, Temperature rise of, with oil removed, 27, 617.
Windings, oil immersed:
  Measurement of temperature of, 11.
  Temperature rise of, 27, 135, 162, 485, 501, 515, 532, 572, 583, 617, 669.
  Temperature rise of, effect of atmospheric conditions on, 162, 172, 174, 244, 540, 567, 572.
Winnipeg Electric Railway Company, Oil maintenance method of, 102.
Wood, Effect of oil on dielectric strength of, 66.
Wood, oiled, Dielectric properties of, 122.
Wood in oil, Dielectric properties of, 218, 382.
Wrought iron surfaces, Radiation from, 117.

X

Xenon, Use of, over oil in transformers, 534.
X-ray tube, oil-immersed, 616a.
Xylene, Dielectric properties of, 331, 371, 567a.
Xylol, Dielectric properties of, 1, 8, 422, 589, 645.

Z

Zinc:
  Effect of, on formation of sludge, 181, 402, 455, 552–553, 590, 592, 666, 670.
  Effect of, on oxidation of oil, 266.

INTERESTING RECENT ADDITIONS

Industries and Industrial Arts

Allee, W. C., and others. The nature of the world and of man, by W. C. Allee, G. W. Bartelmez, J. H. Bretz, A. J. Carlson, R. T. Chamberlain, F. C. Cole, M. C. Coulter, H. C. Cowles, E. R. Downing, E. O. Jordan, C. H. Judd, H. B. Leman, F. R. Moulton, H. H. Newman, A. S. Romer, and J. Steiglitz. Chicago: University of Chicago Press, 1926. xxiv, 566 p. illus. 8°. $4.00. **OAI (117)**

Members of the faculty of the University of Chicago present outlines of our present knowledge concerning astronomy, earth origin and history, energy, chemical processes, nature and origin of life, bacteria, evolution of the plant kingdom, relation of plants to environment, evolution, inheritance, physiology, and psychology.

Based upon a survey course "designed to give capable students a preliminary view of the rich intellectual fields that lie before them." — *Preface.*

American Oil Burner Association. Handbook of domestic oil burning. New York: American Oil Burner Association, 1926. 224 p. illus. 12°. $2.50. **VHY (117)**

Contents: Definitions, explanations and terms. Heating requirements. Humidity. Seasonal heating demands. Methods of heating. Warm air requirements. Radiators and radiation. Hot water and steam heating systems. Relation of burner to heating system. Oil as a fuel. Fuel oil combustion. Domestic oil burners. Comparative fuel costs. Ordinances and hazards. Oil burning and the architect. Miscellaneous tables.

Intended "to substitute proved engineering principles and data for misinformation and hunch." — *Preface.*

Reviewed in *Oil trade,* Aug., 1926.

Balbi, C. M. R. Loud speakers, their construction, performance and maintenance. A practical handbook for wireless manufacturers and traders and for all wireless amateurs, containing notes on the selection of a loud speaker and on the detection and remedying of faults, with foreword by G. W. O. Howe. London and New York: Isaac Pitman and Sons, 1926. xv, 96 p. illus. 12°. $1.00. **TTF (121)**

Includes a chapter on public address systems.

"We find brief descriptions of nearly all the loud speakers which are now on the market. Although there is an outline of the science of the problems of sound transmission involved in the designs of loud speakers, the book cannot be described as a scientific text-book. It is obviously intended rather for the ordinary user of 'wireless' than for the serious investigator." — *Engineer, June 4, 1926.*

Also reviewed in *Electrician,* Nov. 5, 1926.

* **Biringuccio,** Vanoccio. Biringuccios Pirotechnia, ein Lehrbuch der chemisch-metallurgischen Technologie und des Artillereiwesens aus dem 16. Jahrhundert, übersetzt und erläutert von Dr. Otto Johannsen. Braunschweig: Friedr. Vieweg und Sohn, 1925. xvi, 544 p. illus. 8°. **VI (117)**

Biringuccio (1480–1539) was a foremost metallurgist of his time. The present work is a translation of the first Italian edition (1540), and deals with ores and their reduction, alloys, foundry work, cannon casting, bell founding, and fireworks.

Briggs, Dennis Brook. Practical glass manipulation. London: Crosby Lockwood and Son, 1926. xvi, 39 p. illus. 12°. 2s.6d. **PKV (119)**

Gives detailed and well-illustrated instructions for the preparation of some of the commoner forms, and a few of the more complex kinds, of apparatus which can be constructed for use in the laboratory. Author is Science Master at Bradfield College, England.

Cave, C. J. P. Clouds and weather phenomena, for artists and other lovers of nature. Cambridge, England: University Press, 1926. x, 29 p. illus. 12°. 5s. **PRL (117)**

Considers in a simple way, and with little reference to theory, the secrets of sky color, sunset colors and rays, rainbows, halos, coronae, Brocken spectres, iridescent clouds, mirages, clouds, the moon, and the apparent size of the sun and moon on the horizon. 47 excellent plate illustrations.

"Perhaps one may be allowed to express a doubt whether even an authority like Mr. Cave, backed by the Cambridge University Press, will be able to reform the ways of artists, but all meteorologists will extend a hearty welcome to the book and wish the attempt success." — *Nature, Sept. 11, 1926.*

Colvin, Fred H., and F. A. Stanley. American machinists' handbook and dictionary of shop terms. A reference book of machine shop and drawing room data, methods and definitions. New York: McGraw-Hill Book Company, Inc., 1926. xvii, 972 p. 4. ed. illus. 12°. $4.00. **VFC (121)**

Complete revision of this practical work covers many new practices and standards, among which are tolerances for screw threads for fits of various kinds and for gages with which they are inspected.

Reviewed in *Iron trade review,* Sept. 23, 1926.

Curtis, Harry P. The testing of yarns and fabrics. For manufacturers, warehousemen and operatives, also for drapers, laundrymen and clothiers. London and New York: Isaac Pitman and Sons, 1926. xii, 168 p. illus. 12°. $1.50. **VLB (121)**

"The tests given are quite adaptable to any and every branch of the textile trades, they are simple to apply, and the chemicals and apparatus described are easy to manipulate. The more scientific tests are not given, because they must belong to the scientist and research chemist." — *Preface.*

Daly, Reginald Aldworth. Our mobile earth. New York: Charles Scribner's Sons, 1926. xxii, 342 p. illus. 8°. $5.00. **PTI (117)**

Copiously illustrated and non-technical account of the great earthquakes of history, the nature of earthquakes, the earth's interior, volcanic action, changes of level and earth distortion, mountain ranges and their origin, and evolution of the face of the earth, with a list of suggested works of reference. Author is Professor of Geology at Harvard University.

Davis, Charles G. The ship model builder's assistant. Salem, Massachusetts: Ma-

Industries and Industrial Arts, continued.

rine Research Society, 1926. vi, 275 p. 8°. $5.00. **VXH (121)**

Copiously illustrated directions for building a *built-up* completely rigged model.

Reviewed in *Marine journal,* Oct. 2, 1926.

***Dobson,** G. M. B., and others. Photographic photometry, a study of measuring radiation by photographic means, by G. M. B. Dobson, I. O. Griffith, and D. N. Harrison. New York: Oxford University Press, American Branch, 1926. 121 p. illus. 12°. $2.50. **PEO (117)**

"It seems, therefore, worth while to try to review the whole subject, discussing the principal methods employed, the sources of error, how these errors can be minimized, and generally to find the best method of working. Various papers have dealt with individual points, but no general review seems to have been written. It is hoped that the present notes may be of use to any one starting work in this subject." — *Introduction.*

Reviewed in *Observatory,* Sept., 1926; *Nature,* Nov. 13, 1926.

***Elsdon,** G. D. The chemistry and examination of edible oils and fats, their substitutes and adulterants. London: Ernest Benn, Ltd., 1926. xix, 521 p. illus. 8°. 45s. **VON (119)**

"It is, as might be expected, mainly analytical, and one would hardly think that it is of equal value to the manufacturer. There are nine chapters dealing with the general physical and chemical properties of oils and the usual tests; then follow twenty-two chapters describing the various edible oils in detail, and giving a wealth of examples which are cited from the literature rather than the author's own experience... Mr. Elsdon has done a good work in providing an epitome of all that is new and important on the subject, and has produced a volume which all chemists concerned with oils will secure for their shelves as a matter of course." — *H. E. Cox in Chemistry and industry, Oct. 29, 1926.*

Also reviewed in *Chemical age,* London, Oct. 16, 1926.

Ensinger, Earl W. Problems in artistic wood turning. Milwaukee: Bruce Publishing Company, 1926. 71 p. obl. 12°. $1.25. **VFW (121)**

Directions for making beautiful and useful articles are accompanied by photographs and scale drawings. No attempt has been made to go into the technique of handling tools or to describe common processes. Author is instructor in the Arsenal Technical Schools, Indianapolis.

Fabre, Jean Henri. Here and there in popular science. Edited, annotated, and translated by Percy F. Bicknell. New York: The Century Company, 1926. viii, 409 p. illus. 8°. $2.50. **OAG (117)**

Wonders of astronomy, plant life, and physiology set forth in the author's admirable style, but no attempt has been made to bring the book up to the minute in every particular.

Farrell, Hugh. What price progress? The stake of the investor in the discoveries of science. New York: G. P. Putnam's Sons, 1926. viii, 323 p. $1.00. **VOD (119)**

The financial editor of the *New York Commercial* gives a comprehensive view of several American industries and tells how their prosperity or failure is dependent upon research. Technical processes are described in a "popular" style.

***Freundlich,** Herbert. Colloid and capillary chemistry, translated from the third German edition by H. Stafford Hatfield. London: Methuen and Company, Ltd., 1926. xv, 883 p. 4°. 50s. **PLD (119)**

"The original is now so well known to all students of the subject that little remains to be said about it. The first section, dealing with capillary chemistry in the narrower sense, *i.e.,* with the phenomena at interfaces, and amounting to more than one-third of the work, is the best and most comprehensive account of the subject at present available in any language. The second part, colloid chemistry in the generally accepted meaning of the term, while not quite so unique, holds a very high place among the many text books published in recent years." — *Chemical age, London, Sept. 25, 1926.*

Also reviewed in *Journal of the Franklin Institute,* Nov., 1926.

Fuller, George W., and J. R. McClintock. Solving sewage problems. New York: McGraw-Hill Book Company, Inc., 1926. x, 548 p. illus. 8°. $6.00. **VDI (121)**

"While the book is, therefore, a manual of the entire subject, particular consideration is given to natural purification of streams, basic design data, plain sedimentation tanks, sludge digestion processes, separate sludge digestion tanks, the collection and utilization of gas, screens, trickling filters, the activated sludge process, and industrial wastes. Those are the subjects in which city officials and their engineering advisers are now most often interested." — *Preface.*

***Hall,** A. J. Textile bleaching, dyeing, printing and finishing machinery. London: Ernest Benn, Ltd., 1926. xvi, 320 p. 4°. 50s. **VLB (121)**

Brief descriptions of a large variety of British machines illustrated by numerous cuts from trade catalogues.

Reviewed in *Machinery market,* Sept. 3, 1926; *Dyer and calico printer,* Nov. 15, 1926.

Hardy, A. C. From slip to sea, a chronological account of the construction of merchant ships from the laying of the keel plate to the trial trip, with over 154 sketches and illustrations. Glasgow: James Brown and Son; New York: D. Van Nostrand Company, 1926. xvi, 252 p. illus. 8°. $4.00. **VXH (121)**

"For the benefit of all those who would learn what are the various successive stages in the construction of a steel vessel and how the structure is put together, this book has been written. No book of similar character has previously been offered by a publisher in any country. There are many who can learn much by reading it. Written in plain simple language, illustrated by many sketches as well as half-tones, its contents are clear and easily assimilable." — *Motorship, Oct., 1926.*

Also reviewed in *Shipbuilding and shipping record,* Aug., 1926; *Nautical magazine,* Aug., 1926.

Ibbetson, W. S. Accumulator charging, maintenance and repair. Intended for the use of all interested in the charging and upkeep of accumulators for wireless work, motor-car lighting and starting equipment, and country house lighting plant. London and New York: Isaac Pitman and Sons, 1926. x, 118 p. illus. 12°. $1.00. **VGH (121)**

Contains sufficient theory, treated in a simple and direct way, to enable the reader to understand underlying principles. Good diagrams.

* **Kaula,** R. J., and I. V. Robinson. Condensing plant, a complete treatise on the principles and details of construction of modern steam condensing apparatus for de-

Industries and Industrial Arts, continued.

signers, users and students. London and New York: Isaac Pitman and Sons, 1926. xiii, 400 p. illus. 8°. $8.50. **VFK (121)**

"The principles of design of surface condensers are very carefully gone into, and typical designs described and illustrated; and the same may be said of jet condensers. Reciprocating and rotary air pumps are dealt with, and various problems of their design examined. The book is thoroughly up to date...and the authors' handling of the numerous difficult problems of design is admirable." — *Shipbuilding and shipping record, Sept. 2, 1926.*

Kuns, Ray F. Automotive electrical practice. Milwaukee: The Bruce Publishing Company, 1926. 516 p. illus. 8°. $3.50. **TON (121)**

Copiously illustrated, practical work by the principal of the Automotive Trades School, Cincinnati, Ohio.

Deals with the specific problems arising in service stations. Fundamentals of electrical data are explained in the introduction. Part I covers the care and servicing of storage batteries used for automobile starting, lighting, and ignition, also with farm lighting, radio batteries and the Edison storage battery. Part II covers the care and servicing of other types of automobile electrical equipment. There is also a chapter devoted to the organization of a commercial shop.

Larrett, Denham. The story of mathematics, with a foreword by C. G. Darwin. London: Ernest Benn, Ltd., 1926. 87 p. 3s.6d. **OEC (117)**

Disclaiming any intention of teaching the reader mathematics, the author skims in a brief and pleasant way over the history of the subject and tells us how theory and practice are related, of the nature of energy, and the meaning of relativity (in six pages).

Lewis, Gilbert N. The anatomy of science. New Haven: Yale University Press, 1926. ix, 219 p. 8°. (Mrs. Hepsa Ely Silliman memorial lectures.) $3.00. **OAP (117)**

Contents: Methods of science; numbers. Space and geometry. Time and motion. Matter in motion. Light and the quantum. Probability and entropy. The non-mathematical sciences. Life, body and mind.

"Although I am chiefly addressing a popular audience, nowhere have I concealed difficulties nor have I wittingly sacrificed accuracy of thought. Indeed I am in part addressing the specialist too, and hope that he may find in the several chapters something new of substance or method." — *Preface.*

* **Meade,** Richard K. Portland cement, its composition, raw materials, manufacture, testing and analysis. Easton, Pa.: The Chemical Publishing Company, 1926. xii, 707 p. illus. 8°. $10.00. **VEO (121)**

Exceeds the 2d edition (1911) by nearly 200 pages and has been revised and rewritten to conform to present day theory and practice. Originally intended primarily for chemists and inspectors as a manual of testing and analysis, but is now largely devoted to manufacture. Includes a chapter on the settling of kiln dust.

"The author's long-established position in the field to which the book is devoted guarantees that it will be a comprehensive and trustworthy guide to both chemist and engineer." — *Henry Leffmann in Journal of the Franklin Institute, Aug., 1906.*

Motz, William H. Principles of refrigeration. A comprehensive treatise on fundamental principles of operation of ice making and refrigerating machinery, properties and values of principal media used in modern refrigerating apparatus; transmission of heat, functions and values of insulating materials; construction and operation of various parts of refrigerating apparatus and application of refrigeration to its varied uses. Chicago: Nickerson and Collins Company, 1926. xi, 657 p. illus. 8°. $5.00. **VOI (119)**

"Written in every day language and is as free as possible from higher mathematics... It is a worthy volume for the library of any refrigerating engineer, plant owner, manager or salesman." — *Refrigerating world, Oct., 1926.*

* **Peirce,** Benjamin Osgood. Mathematical and physical papers, 1903–1913. Cambridge, Mass.: Harvard University Press, 1926. viii, 444 p. illus. 8°. $5.00. **PAG (117)**

Dr. Peirce (1854–1914) was Hollis Professor of Mathematics and Natural Philosophy in Harvard University, where he distinguished himself in the teaching and study of electricity and magnetism. It was said of him that he knew more physics than any other member of the department of physics, and more mathematics than any other member of the mathematical department. The present collection of papers deals principally with magnetism.

Reviewed in *Power,* New York, v. 64, 1926, p. 609.

Schotz, S. P. Synthetic rubber. London: Ernest Benn, Ltd., 1926. 144 p. illus. 4°. 21s. **VMV (121)**

Contents: Raw materials. Isoprene. Butadiene. Dimethylbutadiene. Polymerisation. Vulcanisation. Stabilisation. Properties and constitution of natural caoutchouc and synthetic rubber. History of synthetic rubber.

"We will, however, agree with Dr. Schotz that the work done in this field is of the first order from the technical point of view, and we think he has done chemists a very great service in collecting it, classifying it, and reviewing it so critically." — *Industrial chemist, Oct., 1926.*

Also reviewed in *Nature,* Oct. 9, 1926.

Tinkler, C. Kenneth, and Helen Masters. Applied chemistry. v. 2, Foods. London: Crosby Lockwood and Son; New York: D. Van Nostrand Company, 1925. xi, 276 p. illus. 8°. $6.00. **VOE (119)**

For notice of v. 1, see *New technical books,* July–Sept., 1920, v. 5, no. 3, p. 53. Volume 2 deals in a fairly elementary way with milk, edible oils and fats, carbohydrates, raising agents, meat, meat extracts, vinegar, fruit juices, vegetable acids, beverages, preservation of food, poisonous metals in foods, cooking, condiments, and the calorific value of foods. Includes methods of analyses.

"The book is not believed to be so suitable for American students as are some of the texts published in this country, although it would be interesting and useful to anyone giving a course of instruction in the chemistry of foods to household science and other students." — *R. W. Balcom in Industrial and engineering chemistry, March, 1926.*

***Walsh,** John W. T. Photometry, illustrated with diagrams by Frederick G. H. Lewis and from photographs. London: Constable and Company; New York: D. Van Nostrand Company, 1926. xxvii, 505 p. illus. 8°. $12.00. **PEO (117)**

Complete theoretical and practical treatment of those matters which affect the measurement of light flux, candle-power, illumination, etc., *excluding* consideration of the use to which such measurements may be put after they have been made. Extensive bibliographies at chapter endings. Author is Senior Assistant in the Photometry Division of the National Physical Laboratory of Great Britain.

"Truly a monumental work. It is not too much to assert that this volume is the finest work on this subject that has ever been written." — *Electricity, London, Aug. 27, 1926.*

CIRCULATION STATISTICS FOR THE MONTH OF NOVEMBER, 1926

BRANCHES	CIRCULATION		NEW REGISTRATIONS	VOLUMES ACCESSIONED
	HOME USE (VOLUMES)	READERS OF REFERENCE BOOKS		
Manhattan				
Central Building	57,155	---	1,239	591
Children's Room	3,192	3,598	83	158
Extension Division*	49,412	---	992	1,711
Library for the Blind	3,026	---	13	119
East Broadway, 33	12,019	2,181	198	581
East Broadway, 192	28,641	4,831	449	627
Rivington street, 61	19,408	2,851	278	374
East Houston street, 388	21,430	3,707	328	899
Leroy street, 66	13,791	1,773	260	103
8th street, 135 Second avenue	14,182	1,330	227	255
10th street, 331 East	24,012	2,005	340	780
13th street, 251 West	11,163	1,535	151	211
23rd street, 228 East	10,968	1,546	255	220
23rd street, 209 West	9,498	1,068	223	207
36th street, 303 East	10,915	1,148	181	153
40th street, 457 West	12,444	812	179	201
50th street, 564 Lexington avenue	8,892	559	134	172
51st street, 742 Tenth avenue	15,198	992	199	265
58th street, 121 East	12,882	2,100	304	244
Music	2,334	1,577	41	33
67th street, 328 East	19,212	2,688	268	416
69th street, 190 Amsterdam avenue	15,650	1,680	338	171
77th street, 1465 Avenue A	22,197	1,249	251	380
79th street, 222 East	18,770	1,320	301	302
81st street, 444 Amsterdam avenue	16,775	1,195	409	270
96th street, 112 East	32,204	3,793	356	353
100th street, 206 West	21,235	1,460	478	490
110th street, 174 East	26,708	3,504	480	338
115th street, 203 West	19,837	1,326	318	351
124th street, 9 West	12,804	1,582	193	309
125th street, 224 East	13,876	1,119	318	147
125th street, 518 West	21,125	1,362	262	442
135th street, 103 West	13,678	3,139	317	234
145th street, 503 West	22,582	1,030	401	283
St. Nicholas avenue, 1000	19,287	1,655	349	261
179th street, 535 West	26,667	2,185	466	399
The Bronx				
140th street, 321 East	22,428	2,443	562	471
Morris avenue, 910	20,018	2,233	353	199
160th street, 761 East	34,356	4,344	369	901
168th street, 78 West	9,645	705	221	72
169th street, 610 East	31,119	2,759	578	675
176th street and Washington avenue	41,623	4,492	681	868
Bainbridge avenue, 2556	36,132	3,741	702	643
Kingsbridge avenue, 3041	5,797	687	122	86
Richmond				
St. George	9,024	3,360	193	125
Port Richmond	12,637	959	241	151
Stapleton	8,254	387	108	142
Tottenville	6,530	387	50	52
Totals	900,732	90,397	15,759	17,435

* In addition 5,917 books were read at agencies of the Extension Division.

PRINCIPAL DONORS IN NOVEMBER, 1926

	VOLS.	PMS.
Accademia Pontaniana	1	
Accademia Scientifica Veneto-Trentino-Istriana	3	
Adler, Elmer (1 print)		
Alden Kindred of America, Inc.		1
Algeo, Mrs. Sara M.	2	
Astor, Vincent, Office of	57	
Baden, Ministerium des Innern	2	
Beckhart, Benjamin Haggott, M.A.	1	
Bowker, R. R.	1	
Bucarest, Service Municipal de Statistique	1	
Bulgarskata Akademiya na Naukitye	7	
Bullock-Webster, L.		6
Canada. Archivist	1	
Cawley, Robert Ralston		1
Champion, Édouard	1	
Churchill, F. G.	1	
Cole, George N. (1 chart)		
Communist Party of Great Britain — Publications Department		23
Cooke, Frank L.	34	
Deutschnationale Schriftenvertriebsstelle, G.m.b.H.		23
Drumheller, Jr., Dan and Family	1	
Emery, Samuel	1	
Empire Cotton Growing Corporation		2
Engineering Societies Library	482	642
Evans, Harry C.	1	
Figueíra, Gastón	1	
France. Ambassade de France aux Etats-Unis	1	
Gefle Handelskammaren	21	
Gisnet, Morris	20	26
Goldsmith, Alfred F. (7 prints, 3 playbills)	13	40
Gualino, Riccardo	1	
Guildhall Library		1
Haskell, Mrs. Florence E.	1	
Heydecker, Coral T.		1
Hotchkin, W. R.	1	
Huffmaster, James T.		2
India, Bombay Secretariat. Revenue Department	1	
India, Madras. Local Self-Government Department	2	50
Italy. Ministero delle Colonie	1	
Johnston, Albert J.		1
Kahn, Mrs. Max	1	
Kent, Norman (1 print)		
Koenig, Henry A.	7	

	VOLS.	PMS.
Krymoff, Dr. V.	2	
Latvia. Legation to the United States	1	
Lecompte, R. P.		2
Liceo de Costa Rica	1	11
Luebeck, Germany. Secretary of the Senate	19	16
McCollum, C. L.		1
Maclean, John (1 sheet)		2
Marcuse, Miss (26 periodicals)		
Mazel, Harris		3
Metropolitan Opera Co.	21	
Mexico. Museo Nacional de Arqueología, Historia, y Etnologia	1	
Mitchell Library		18
Mittleman, Dr. J. H. (15 newspapers)	6	453
Montreal. Department of Health	30	
Munroe, Henry Smith		1
National City Financial Library (61 periodicals)	182	151
National Civic Federation	7	37
Paccagnella, Ermenegildo		3
Parsons, Gen. William Barclay		1
Pettit, Walter W.		38
Phillips, Rev. Emil	1	
Plowman, George T. (4 prints)		
Pocumtuck Valley Memorial Association	1	
Portugal. Provincia de Angola. Direcçao dos Serviços Aduaneiros	12	2
Portugal. Provincia de Cabo Verde. Secretaria Geral	9	
Quiñónez-Molina. Dr. Don Alfonso	1	
Ranković, Brigadier General Živ. J.	1	
Ridgway, George C.	1	
Robbins, Samuel D.	1	
Scatori, Stephen	1	
Schwarz, Mrs. C.	54	8
Sexton, Mrs. Lucy A. F.	1	
Shastid, Thomas Hall		1
Short, Rev. Charles L. (1 drawing)		
Society of Friends of Roumania	1	
Sossnitz, Dr. I.	1	
Spain. Dirección General de Obras Públicas	4	
"Toc H". The Registrar	2	17
Tremblay, Jules	1	
Varney, John Cushing	1	
Welles, Lemuel A.		1
Whicher, George Meason		1
Windsor Press		1
Wolf, Rev. Thomas	1	

PUBLICATIONS OF THE NEW YORK PUBLIC LIBRARY

(Now in Print)

HISTORY AND GUIDES

	PRICE
History of The New York Public Library, by H. M. Lydenberg. 1923	$2.00
Handbook of The New York Public Library	.25
Facts for the Public	.05
Central Building Guide	.05
Questions About Your Library (General Information about the Library)	Free
For Sightseers. Central Building	Free

PERIODICALS

Annual Report of The New York Public Library. (A limited number are given free upon request.)

Bulletin of The New York Public Library. Published monthly. Chiefly devoted to the Reference Department. Bibliography, news of the Library, reprints of manuscripts, descriptions of new accessions. $1.00 a year; current single numbers for 10 cents. Back numbers at advanced rates.

Branch Library Book News. A selected list of new additions to the Circulation Department, with other lists and articles. Published monthly, except in July and August. For sale at the Branches and at the Inquiry Desk. 2 cents a copy; 25 cents a year, postpaid.

New Technical Books. A selected list of books on industrial arts and engineering, recently added to the Library. Published quarterly. 25 cents a year, postpaid.

Municipal Reference Library Notes. Published weekly except during July and August, for circulation among the officials and employees of the City of New York. Price: $2.00 a year; 5 cents a copy. Apply at Room 512, Municipal Building.

LIST OF BOOKS IN THE LIBRARY RELATING TO VARIOUS TOPICS, TEXTS PRINTED FROM MANUSCRIPTS OWNED BY THE LIBRARY, ETC.

REFERENCE DEPARTMENT

	PRICE
Almanacs, A list of New York, 1694–1850. 1921	1.00
American Interoceanic Canals. A list of references. 1916	.30
American-Romani Vocabulary, by Albert Thomas Sinclair. 1915	.05
Armenia and the Armenians. A list of references. 1919	.30
Article of Faith, An, by Hiller C. Wellman. 1919	.05
Assyria and Babylonia. A list of references. 1918	.45
Astor Library, Catalogue of the. 8 volumes. Sewed. Per volume	5.00
Automobile Tires. A list of references. 1923	.10
Avery Collection, Handbook of. 1901. 84 p.	.50
Avery Collection, Handbook of — Supplement: Additions of Prints, 1901–1920. 1921	.15
Avesta and Romani, by Albert Thomas Sinclair. 1916	.05
Beadle Collection of Dime Novels. 1922	.50
Beaumarchais, Editions of, in New York City. 1925	.15
Berlin and the Prussian Court in 1798. From a ms. journal of Thomas Boylston Adams. 1916	.15
Billings, Dr. John Shaw, Memorial Meeting in honor of the late. 1913	.10
British Genealogy and Local History, List of works relating to. 1910	1.15

	PRICE
City Planning and Allied Topics, Select list of works relating to. 1913	.15
Color Photography. 1924	.75
Columbus. Letter of Columbus on the discovery of America. Facsimile of the pictorial edition, with a new and literal translation, and a complete reprint of the four oldest Latin editions. 1892. Cloth	.50
Commencement Addresses by Stephen H. Olin and Carl B. Roden. 1924	.10
The Compensations, by Asa Don Dickinson. 1922	05
Cruise of the U. S. Brig *Argus* in 1813. Journal of Surgeon James Inderwick. 1917	.10
Dehydrated Foods. A list. 1917	.05
Diplomatic History of the European War. A list of references. 1917	.10
Does New York Know New York? Its Library, for Instance, by Edward J. O'Brien. 1919	Free
Druids and Druidism. A list of references. 1920	.05
Early American Poetry, 1610 to 1820. A list of works. 1917	.20
Echo-Device in Literature. By Elbridge Colby. 1920	.25
Egypt, Ancient. Sources of Information. 1925	2.75
Emmet Collection of Mss., Prints, etc., Catalogue of. Sheets. 1900	5.00
Eno Collection of New York City Views. 1925	.75
Flatboating on the Yellowstone, 1877. By Fred G. Bond. 1925	.25
Folk Music of the Western Hemisphere. 1925	.50
Geology, Mineralogy and Palæontology of New Jersey, List of works on. 1916	.15
Gypsies in Carniola and Carinthia, by Albert Thomas Sinclair. 1917	.05
Gypsies of Monastir, by Rev. Lewis Bond. 1917	.05
Henry George and the Single Tax. 1926	.50
Heritage of the Modern Printer, by Margaret B. Stillwell. 1916	.05
Historical Printing Club, Publications of the. (List of prices furnished upon application.)	
Historical Prints and Early Views of American Cities. Catalogue of Exhibition. 1917	.05
Holcroft, Thomas, A Bibliography of. By Elbridge Colby. 1922	.60

	PRICE
Holt, John — Printer and Postmaster. 1920	.10
Hudson, Henry, The Hudson River, Robert Fulton and Steam Navigation, List of prints, books, manuscripts, etc., relating to. 1909	.30
Inks, Chemistry and Manufacture of. 1926	.75
Inventory of the Rensselaerswyck Manuscripts. 1924	25
Irvingiana, The Seligman Collection of. 1926	.25
Isle de Bourbon (Réunion) Documents, 1701–1710. Printed from the original manuscript in the Library. 1909	.20
Japanese-American Relations. A list of works. 1921	.40
Jesuit-Huron Relation of 1648–1649 — A hitherto unknown edition of. By V. H. Paltsits. 1923	.05
The Jewish Division in the Reference Department. 1926	Free
Journalism. A bibliography. 1924	2.00
Joys of Librarianship, by Arthur E. Bostwick. 1918	.05
Kennan Collection. By Abraham Yarmolinsky. 1921	.10
Latin-American Periodicals Current in the Reference Department. 1920	.05
Letters of American Clergymen, 1711 to 1860. 1917	.05
Letters of American Physicians and Surgeons. 1919	.05
The Librarian Himself, by H. L. Koopman. 1916	.05
Librarian as a Unifier, by Andrew Keogh. 1915	.05
Library Tonic, by George Parker Winship. 1917	.05
The Lost Librarian, by Miss G. M. Walton. 1925	.10
Lycanthropy. A list of works. 1920	.05
Macpherson's Ossian and the Ossianic Controversy. A contribution towards a bibliography. 1926	.25
The Manuscript Division, by Victor Hugo Paltsits. 1915	.15
Mountaineering. Selected list. 1916	.05
Music Publishers in New York City before 1850. A directory. 1917	.10
Nationalization of Coal Mines. 1920	.10
Naval Architecture and Shipbuilding. A list of references. 1919	.20
The New York Public Library and the Business Man. 1923	Free

	PRICE
Newspapers and Official Gazettes, Checklist of. 1915	1.85
Numismatics. List of works. 1914	.65
Old Prints in the Prints Division. 1918	.05
Orlando Gibbons Tercentenary, by Jeffrey Mark. 1926	.15
Oxy-Acetylene Welding. List. 1914	.15
Pageants in Great Britain and the United States. A list of references 1916	.15
Paintings, Catalogue of, in the picture galleries of the Library. 1912	.10
Persia, List of works relating to. 1915	.50
The Photostat in Reference Work. 1925	.15
The Pitcairn Bible. 1924	.15
Prints and their Production: Supplement. 1917	.05
Provençal Literature & Language. 1925	3.00
Robinson Locke Dramatic Collection. 1925	.10
Romani and Dard, by George F. Black. 1916	.05
Russian, other Slavonic and Baltic Periodicals, A list of. 1916	.15
Schoolroom Decoration. A list of references. 1917	.05
Scientific Management. A list of references. 1917	.25
Scotland. A list of works. 1916	3.00
Shakespeareana, Catalogue of Exhibition of, compiled by Henrietta C. Bartlett. 1916	1.00
The Soul of the Library, by J. I. Wyer. 1923	.05
Spalding Baseball Collection. 1922	.20

	PRICE
Stauffer Print Collection, by Charles Allen Munn. 1916	.05
Storage Batteries. A list of references, 1900–1915. 1915	.15
Submarines. A list of references. 1918	.35
Superstructures, by W. N. C. Carlton. 1918	.05
Tilden, S. J. Letters and Literary Memorials, edited by John Bigelow. 2 v. 1908	6.00
Tilden, S. J. Writings and Speeches, edited by John Bigelow. 2 v. 1885	6.00
Timothy Dexter and His "Pickle for the Knowing Ones." 1922	.15
To Nebraska in '57. A Diary of Erastus F. Beadle. 1923	2.00
Torpedoes. A list of references. 1917	.30
The Walt Whitman Exhibition. By Emory Holloway. 1925	Free
War Memorials. A list. 1919	.05
War Taxation, 1914–1917. A list of references. 1917	.05
Washington Eulogies. A checklist. 1916	.25
Washington's Note Book. Selections from a newly discovered manuscript, edited by Victor Hugo Paltsits. 1920	.05
What Did Macaulay Say About America? Text of four letters to Henry S. Randall. 1925	.40
What's the Matter with the Public Library? By E. L. Pearson. 1922	Free
Why They Came to the Library. 1920	Free
Winthrop, Theodore, Bibliographical notes on, by Elbridge Colby. 1917	.05
Winthrop Books, Plates of the, by Elbridge Colby. 1918	.05

MUNICIPAL REFERENCE LIBRARY

Publications to be obtained at the Municipal Reference Library, Room 512, Municipal Building.

	PRICE
Guide Posts on the Road to Health; A list of books	.10
Teaching Citizenship via the Movies. A survey of civic motion pictures	.10
Visualizing Citizenship	.15
What to Read on New York City Government. A list of references	.05

CIRCULATION DEPARTMENT

Publications to be obtained at any Branch Library, or from the Chief of the Circulation Department, 476 Fifth Avenue. Publications given free unless otherwise stated.

Branch Library Book News. *See* Periodicals.

LISTS OF BOOKS FOR ADULTS

Altman Collection

Books of Interest to Women Voters

Catalogue of Books for the Blind in Revised Braille. Grades One, Two and Three. November, 1921; Supplements, December, 1922; January, 1925

Catalogue of Books for the Blind in Revised Braille. Grade One-and-a-Half. November, 1921; Supplements, October, 1924; May, 1925

Catalogue of Books for the Blind in the Moon' type. November, 1921; Supplements, December, 1922, October, 1924

Catalogue of Music Scores in the Braille Type. July, 1922; Supplement, September, 1923

Christmas Exhibit

Current Periodicals and Newspapers on File at the Branches

Fairy Tales for Grown-up Readers

List of Piano Music

Military Training

"The New York of the Novelists"

Old-Fashioned Novels

Plays of Thirteen Countries

Poetry of the Supernatural

Polish Book List

Romans à Clef; A List of Novels with Characters based on Real Persons

Sailor's Yarns. 2 cents.

Stories of Romance and Imagination

Stories of the Sea. 5 cents.

Supplement to the Catalogue of Music for the Blind. Music Scores in the American Braille and New York Point Types

Wanderers and Vagabonds

LISTS FOR CHILDREN

Favorite Stories of the Library Reading Clubs

Journeys to Foreign Lands

LISTS FOR ADULTS AND CHILDREN

New York City and the Development of Trade

Sea and Shore

The Shakespearian Festival

BOARD OF TRUSTEES

W. Vincent Astor
George F. Baker, Jr.
Samuel Greenbaum
Edward S. Harkness
Patrick Cardinal Hayes
Arthur Curtiss James
Grenville Kane
Lewis Cass Ledyard
John G. Milburn
J. Pierpont Morgan
Morgan J. O'Brien
William Barclay Parsons
Frank L. Polk
Elihu Root
Edward W. Sheldon
I. N. Phelps Stokes
Henry Walters
Payne Whitney
Bronson Winthrop

James J. Walker, Mayor of the City of New York, *ex officio*
Charles W. Berry, Comptroller of the City of New York, *ex officio*
Joseph V. McKee, President of the Board of Aldermen, *ex officio*

OFFICERS

President, Lewis Cass Ledyard, 476 Fifth Avenue.
First Vice-President, Elihu Root.
Second Vice-President, ———
Secretary, Frank L. Polk.
Treasurer, Edward W. Sheldon, 45 Wall Street.
Assistant Treasurer, United States Trust Company, 45 Wall Street.
Director, Edwin H. Anderson, 476 Fifth Avenue.

Chief Reference Librarian, H. M. Lydenberg, 476 Fifth Avenue.
Chief of the Circulation Department, Franklin F. Hopper, 476 Fifth Avenue.
Editor, Edmund Pearson, 476 Fifth Avenue.

BUILDINGS AND BRANCHES

Central Building, 476 Fifth Avenue, contains general administrative offices of the whole system, all Divisions of the Reference Department, and the Central Circulation Branch, Central Children's Room, Library for the Blind, and the Extension Division.

Municipal Reference Branch, Room 512, Municipal Building. (Free for reference.)

CIRCULATION BRANCHES

MANHATTAN

33 East Broadway. (Chatham Square.)
192 East Broadway. (Seward Park.)
61 Rivington Street.
388 E. Houston St. (Hamilton Fish Park.)
66 Leroy Street. (Hudson Park.)
135 Second Avenue. Near Eighth Street. (Ottendorfer.)
331 East 10th Street. (Tompkins Square.)
251 West 13th Street. (Jackson Square.)
228 East 23rd Street. (Epiphany.)
209 West 23rd Street. (Muhlenberg.)
303 East 36th Street. (St. Gabriel's Park.)
457 West 40th Street.
564 Lexington Avenue. (Cathedral.)
742 Tenth Avenue. Near 51st Street. (Columbus.)
121 East 58th Street.
328 East 67th Street.
190 Amsterdam Avenue. Near 69th Street. (Riverside.)
1465 Avenue A. Near 78th St. (Webster.)
222 East 79th Street. (Yorkville.)
444 Amsterdam Avenue. Near 81st Street. (St. Agnes.)
112 East 96th Street.
206 West 100th Street. (Bloomingdale.)
174 East 110th Street. (Aguilar.)
203 West 115th Street.
116th Street and Amsterdam Avenue. Room 108a, Columbia University Library (Columbia Sub-branch.)
9 West 124th Street. (Harlem Library.)
224 East 125th Street.
518 West 125th Street. (George Bruce.)
103 West 135th Street.
503 West 145th Street. (Hamilton Grange.)
1000 St. Nicholas Avenue. Cor. 160th Street. (Washington Heights.)
535 West 179th Street. (Fort Washington.)
178 Sherman Ave. (Inwood Sub-branch.)

THE BRONX

321 East 140th Street. (Mott Haven.)
761 East 160th Street. (Woodstock.)
910 Morris Avenue. Corner 162nd Street. (Melrose.)
78 West 168th Street. (High Bridge.)
610 East 169th Street. (Morrisania.)
1866 Washington Avenue. Cor. 176th Street. (Tremont.)
80 West 181st Street. (University Heights Sub-branch.)
1741 Wallace Ave. (Van Nest Sub-branch.)
2556 Bainbridge Avenue. (Fordham.)
3041 Kingsbridge Avenue. Near 230th Street. (Kingsbridge.)
3917 White Plains Road. Near 223rd Street. (Williamsbridge Sub-branch.)
325 City Island Avenue. (City Island Sub-branch.)

RICHMOND

5 Central Avenue, Staten Island. (St. George.)
75 Bennett Street. (Port Richmond.)
85 State Street. (West New Brighton Sub-branch.)
132 Canal Street. (Stapleton.)
7430 Amboy Road. (Tottenville.)
56 Gifford's Lane. (Great Kills Sub-branch.)
180 Rose Avenue. (New Dorp Sub-branch.)

3 8198 314 314 52